Gas Journal

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[Founded in 1849 as the "Journal of Gas Lighting."]

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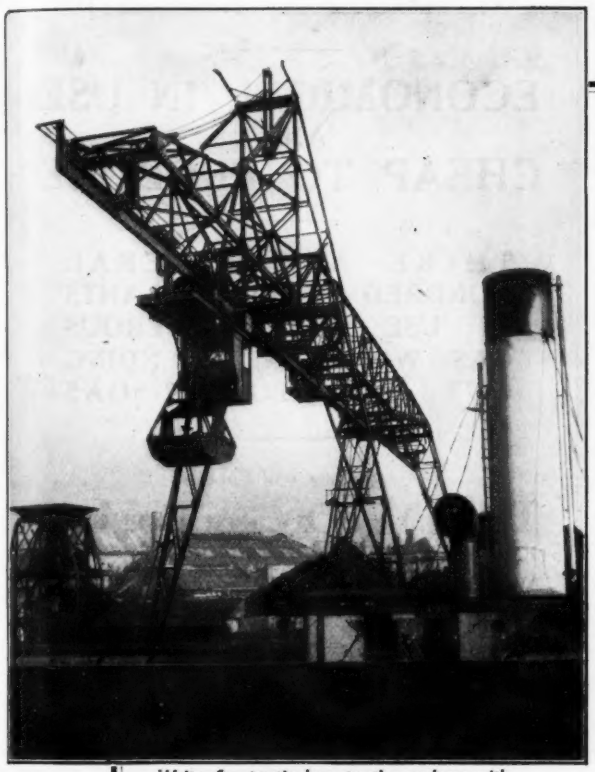

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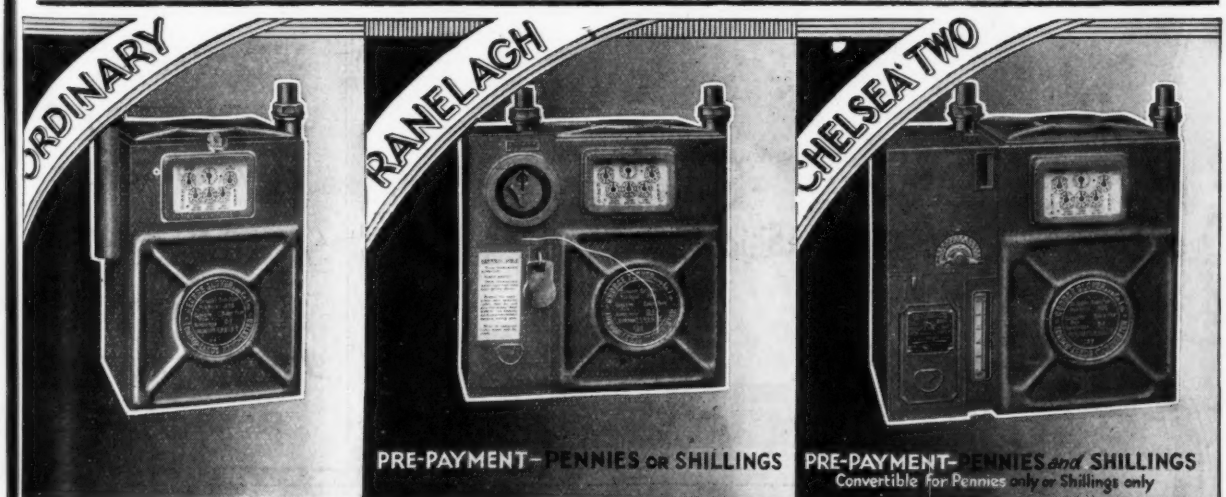

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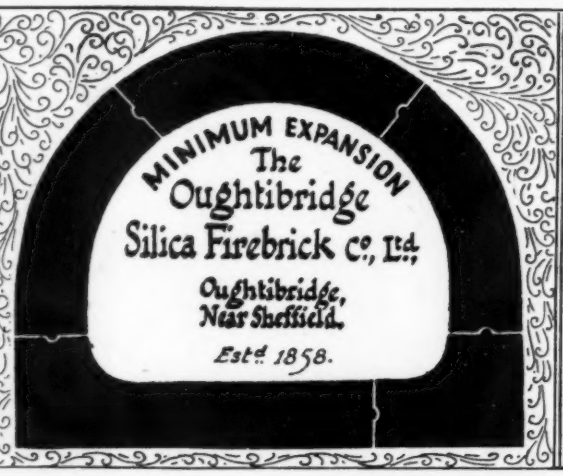

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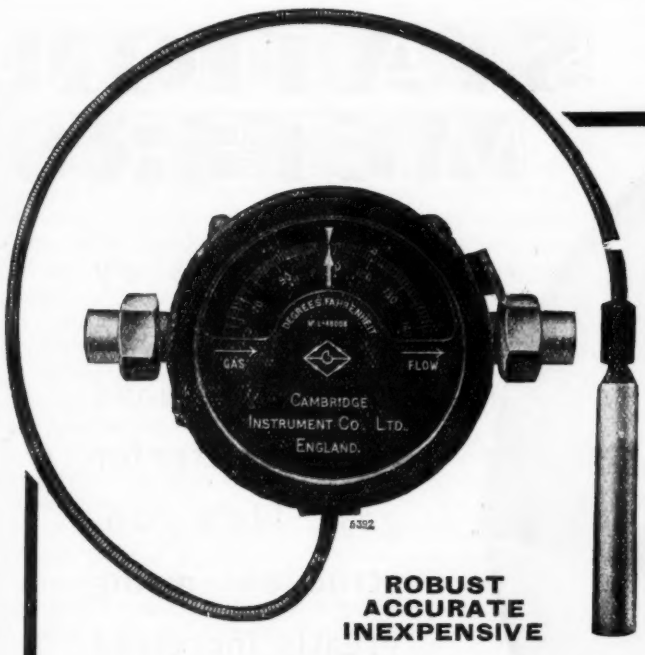

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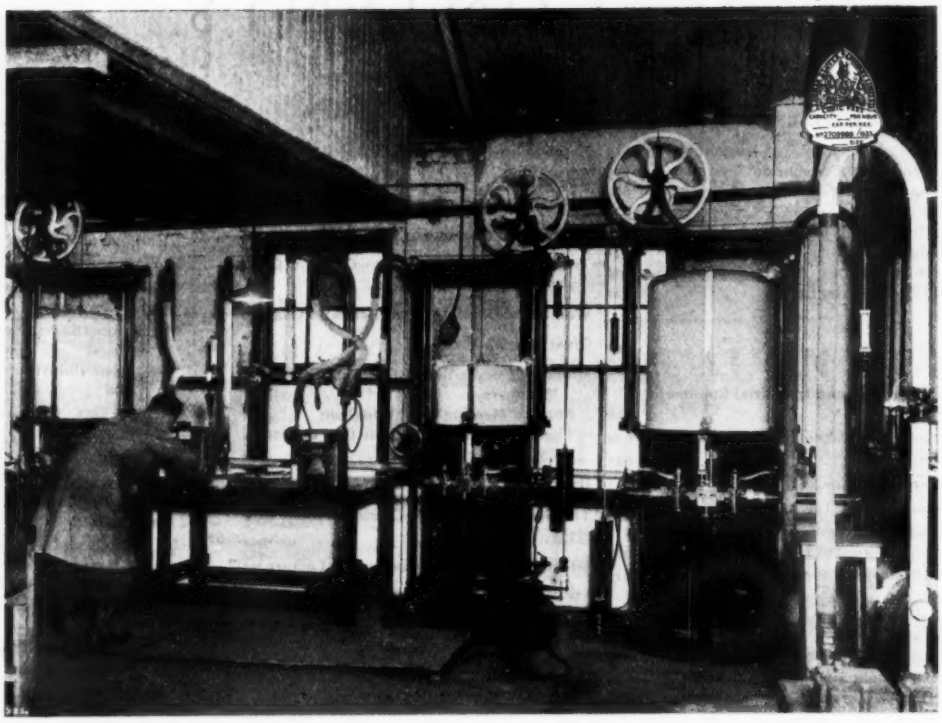

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Gas Journal

NOVEMBER 27, 1935

Vol. 212. 87th Year No. 3784

Editorial Notes

Coal Prices

As one of the coal industry's best customers, the Gas Industry has no wish to purchase coal below the cost of production; and, in spite of many statements to the contrary, we may be pardoned for suggesting that, in what is no longer a free market, it is not doing so. Moreover, bearing in mind what it costs to mine a ton of coal, we may be pardoned also for regarding with a certain questioning the great difference in cost at which electricity undertakings can buy coal as compared with gas undertakings. As for helping rather than hindering the coal trade, the attitude of the Gas Industry has been publicly expressed on more than one occasion recently by Colonel Carr as President of The Institution of Gas Engineers. It is simply that, on a proved case, the Gas Industry is extremely anxious that the miner should be in a better position, and is willing to pay more for its coal provided there is no discrimination between one user and another. It does not fear the hands of Government if applied impartially; it does strongly oppose discrimination. The Gas Industry has put its views forward in a friendly spirit. It would welcome a definite assurance that the miner would derive benefit from increased price, and that if the price of coal were advanced to public utility undertakings the coalowner should not be in a position to supply his own gas-works (the coke ovens) with coal charged up at a very much lower price than that applied to gas undertakings generally. It has also legitimately asked that any increase in price which the Gas Industry may have to find will not be applied to a reduction of the price of household coal.

As a great public service the Gas Industry has a duty to perform in supplying its ever-increasing body of consumers with smokeless fuels at a price as low as possible. Its 10,000,000 customers will not regard with lively satisfaction internal juggling of prices by the coal industry to lower the cost of burning raw coal at the expense of the public's demand for clean smokeless fuels. As we have said, the Gas Industry's attitude is one of co-operation, and it contrasts strangely with recent happenings and utterances by coal interests. Mr. F. M. Brown, of Mapperley Collieries, just elected to the Presidential Chair of the Midland Counties' Institution of Engineers, found in his Presidential Address an opportunity of discussing public utilities. "What is still considered as the dross (*sic*) of mining," he said, "and is sold accordingly is the very life-blood of the public utility concerns." The industry still fails to see, or at least fails to recognize, that this cheaply sold small coal is the raw material from which the electricity corporations, gas companies, &c., make the rod with which to belabour the back of the mining industry. Coal thus sold is double acting in its injurious effect. It reduces the difference between production price and average selling price to uneconomic proportions, and it enables gas and electricity to be supplied to the consumer at a price with which the industry cannot economically compete." It cannot be said that this exemplifies a desirable spirit of co-operation.

First National Coal Convention

More important than this, however, were the proceedings at the opening session of a grandiose event held in London last week and organized by the Coal Utilization Council under the title of the first National Coal Convention. After this session it is difficult to regard the activities of the C.U.C. as anything but inimical to the Gas Industry in its business of providing economical smokeless fuels and efficient heat service generally to a clamant market. We learned that the Gas Industry will have to face the fact that the day is coming rapidly when it will have to pay more for its coal, and that, though the installation of gas appliances may cheapen, the cost of their use will be very considerably increased. "What is wanted," said Mr. Norman Fricker, "is cheaper house coal, and if we are to have that the revenues of the pits will have to be increased by a higher price for smalls." As we have said, the Industry is prepared for higher coal prices, but not for the sole object of reducing house-coal prices.

When the C.U.C. was formed in 1931, the Gas Industry was given to understand that, in seeking the progress of the coal industry, the Council would regard it as an ally. As time went on, however, it became more and more difficult to appreciate what was implied by the alliance. By no means all the members of the C.U.C. have worked as though they set any store by the co-operation of the Gas Industry. Printed matter has been periodically issued by coal factors in which gas appliances have been openly attacked. While, on the one hand, enthusiastic citizens backed by a large and growing body of public opinion are working in the laudable cause of smoke abatement, the C.U.C. are to all appearances doing all possible to encourage the burning of coal in its raw state. The Council's efforts are financed by a levy, paid by the customer, on the price of coal; and, as we have said, the Gas Industry is one of the coal industry's best customers. It is all very involved.

Down With the Gas Fire

THE *pièce de résistance* of the opening session of the National Coal Convention was undoubtedly the out-and-out condemnation of the gas fire by Dr. W. J. O'Donovan, a skin specialist, whose brilliant speech definitely brought the house down. His vigorous attack on the gas fire met with enthusiastic applause and loud cheering from the " allies " of the Gas Industry, who formed the bulk of his audience. While the coal fire suggested comfort, said the eminent doctor, gas fires suggested mounting bills at quarter day; they suggested carbon monoxide and the suicide of impecunious relatives. Throughout, the suggestion of the coal fire was homely, comforting, and healing. Discussing illness, Dr. O'Donovan remarked that, when one is lying sick in bed the sensitivity of the mind is more exquisite. " If one looks at a gas fire there is a monotony in its appearance and a constancy of its radiation which mentally and physically do not give a beneficial stimulus such as is obtained from a coal fire. This is affected by every movement of the atmosphere which is obscured by gusts of smoke in the coal fire which plays upon the eyes and mind and skin in a broken and effective way which is not felt when one is exposed to the fixed type of electric or gas glare. . . . Look at the legs of our daughters who toast them through thin stockings in front of the constant heat of a radiant gas or electric fire. After a winter's toasting they are like salamanders with reticular patterns." Dr. O'Donovan went on to explain to an audience whose delight and excitement mounted minute by minute that to expose the skin to the rays of a gas fire for any period of time is very dreadful. The skin cracks, and in its dry state is apt to pick up and suffer from harmful germs and is more apt to be damaged by hot baths, and by the beautifying lotions used by the ladies. Purveyors of patent medicines and cures for such things as eczema should offer their thanks and give a testimonial to those who dry the skin by fixed and monotonous stimuli.

Foes or Friends?

BACK to raw coal, health, and cheerfulness, therefore, is the motto of Dr. O'Donovan. In which connection we recall the observations of Lt.-Col. Langrishe, Lecturer in Public Health at the University of Edinburgh, at a symposium on Smoke Abatement which took place at a joint meeting of the Edinburgh Sections of the Society of Chemical Industry and the Institute of Chemistry—not, be it noted, the Smoke Abatement Society—last month. Having pointed to the physiological ill-effects caused by the shutting-out of sunlight by smoke, he went on to refer to the inter-relation of these ill-effects with the psychological. Smoke-gloom lessens the potential reserve, working power, and well-being of the individual; it increases fatigue, irritability, and restlessness; gloom without makes for gloom within and induces mental depression. Again, by reason of its action on vegetation, smoke exerts a remote, yet highly important, influence on human health. This is a serious thing for children, especially young children, whose diet consists so largely of milk, for if their food is deficient in calcium then not only is their growth retarded but, worse still, they are liable to suffer from rickets. The skin, on the other hand, said Dr. O'Donovan at the National Coal Convention, is one of the most important of the human organs. Yet the policy he advocates of burning raw coal surely must deprive it of the health-giving rays of sunlight. This seems to indicate that " Back to raw coal and disease " would be a better slogan. However, Dr. O'Donovan, who expressed a great respect for tribal medicine, believes that if everybody would watch their skins more carefully they would probably discover reasons for going back to that most ancient fire worship which, although perhaps not a credit to us, is a tribute to our sub-conscious instinct.

At the C.U.C. meeting the hope was expressed by one of our " allies " that the remarkable speech of Dr. O'Donovan should be printed and widely circulated—an idea which met with much approval. In view of previous efforts at friendship with the C.U.C. the Gas Industry will doubtless be anxious to learn what comes of this suggestion, and what steps will be taken if the idea is acted upon. In this matter doubtless the British Commercial Gas Association already have their plans of action. With such a volume of medical opinion in favour of the gas fire in both health and sickness, a little booklet with some such title as " What is one against so many?" might be salutary. We had always understood that in cases of serious illness a uniform and equable room temperature such as is obtained by the use of the gas fire is of no little help towards the recovery of the patient; also, that the noise associated with the use of raw coal is disturbing and detrimental—this apart from the dirt inseparable from the coal fire. Again, we were under the impression that gas fires are extensively used in hospitals and nursing homes and by more than one eminent medical practitioner. If that be true, then, according to Dr. O'Donovan, we are indeed in sorry plight. That doctors differ was never better demonstrated than by the speech of Dr. O'Donovan.

Modern Heating Service

ON a more general platform than that of the C.U.C. last week the subject of gas and coke utilization in modern buildings was dealt with by Dr. Taylor, of the Gas Light and Coke Company, and by Mr. Boon, Manager of the London and Counties Coke Association. The occasion was the Public Works, Roads, and Transport Congress, and the authors set out very clearly how exceedingly well equipped the Gas Industry is to-day to offer a first-class smokeless heating service at low cost, and to what extent it has secured the collaboration of the heating engineer. The value of such collaboration was referred to in no uncertain terms of praise by a heating engineer during the course of the discussion. The Papers themselves—extracts from which are given on later pages—constitute admirable guides for the use of architects and heating engineers and indicate how remarkable have been the advances made in recent years in gas and coke using equipment and how varied is the range of the available apparatus. Both Papers should help towards a better understanding of the problems involved and the methods of their solution and treatment; they certainly show how closely the Gas Industry has studied the relationship of the requirements of heating installations to bodily comfort. It seems likely to us that the trend of heating of public buildings generally will be towards a combination of central heating, either by coke or by gas, to ensure a reasonable " basic " temperature, and sources of radiant heat—again either gas or coke—to ensure cheerfulness and healthy ventilation conditions. The authors have done good service to our Industry in presenting so clearly the facts relating to the use of gas and coke in modern buildings, and we are particularly glad that stress was laid on the selling of " heat service " rather than fuels *per se*, and on the new fields open to gas if attractive tariffs are adopted. On this question of pricing, we hope that the remarks of Colonel Carr, who presided at the session of the Congress at which the Papers were presented, will be responsible for many more converts to modern sales methods.

Developing the Industrial Load

A PAPER of great practical utility was given by Mr. J. E. White, Industrial Gas Sales Manager to the Newcastle and Gateshead Gas Company, at a joint meeting last Wednesday of the North-Western Section of the Institute of Fuel and the Manchester District Association of Gas Engineers. The contribution is particularly helpful in that the Author gives a wealth of information on the working results and costs in the use of gas in the non-ferrous metal industries covering melting, extruding, annealing, sheet and strip rolling and annealing, and also the annealing of brass work for cold working, in which directions considerable development has taken place in the application of gas during the past twelve months. In addition, data are advanced on operations such as carburizing, the rolling of steel sheets and plates, heavy forging and drop stamping, and the punching and drawing of steel ingots.

The Paper is an indication of the growing appreciation by the industrialist of the value of gas as an industrial fuel for both small and large scale applications, the growing realization that fuels must be judged on the "final unit cost of the article produced" basis rather than the number of heat units which can be purchased for a given sum of money. It also emphasizes the attitude which the Gas Industry must adopt if it intends to extend the use of gas in the industrial field. Research must be coupled with the offer of gas at attractive rates. Mr. White maintains, and with full justification, that if our Industry is to show marked progress in its sales during the coming years it will be through the medium of specially priced gas. He points out—not for the first time—that anticipatory costing has enabled many firms to offer to the public motor vehicles which are double the value of the models offered to them less than ten years ago and at half the then cost. The Gas Industry must arrive at a fuller appreciation of the relationship between the true economic value of gas fuel and the industries of the district. Industry, he says, realizes the value of gas and therefore wants gas, but it wants it at its true economic value; in other words, at what industry can afford to pay. Gas undertakings, therefore, should arrive speedily at a definite conclusion as to what extra consumption truly costs, what is a reasonable profit to expect from such consumption, and, in face of competition, at what prices gas can be confidently offered for different industrial processes. These prices necessarily differ widely. Study of the results of those undertakings which are offering to industry gas at attractive rates shows clearly enough that the specially priced industrial gas load is well worth the effort made to secure it. In this regard we call special attention to the development of this load in the Newcastle area since the Company introduced two-part tariff rates in 1929. Actually those consumers taking gas at two-part tariff rates, together with those taking gas at special contract rates, showed an increase of 151 million cu.ft. for 1934, and have shown a further increase of over 118 millions on the first nine months of this year. "Confidence and anticipatory costing" is a good motto for the development of the industrial load.

Coke Oven Gas Supply

ANOTHER eminently practical contribution is that of Mr. J. P. McCrae, Chief Engineer to the Derby Gas Company, given last week to the Midland Association of Gas Engineers and Managers. This, too, will be found on later pages. Mr. McCrae records the facts associated with the engineering work concerned with the taking by his Company of a coke oven gas supply, which was commenced in March, 1932, and which supply now amounts to 1,201 million cu.ft. a year. The scheme cost close upon £100,000, and since its completion an additional mainlaying programme was undertaken to cope with a further million cubic feet of gas a day, bringing the supply to its present total. The result of the work has been to solve distribution problems, and the average price of gas supplied by the Company has been reduced by roughly 2½d. per 1,000 cu.ft. An interesting feature of the scheme, which entailed the laying of 15½ miles of main, erection of purification and naphthalene washing plants and of a 2 million cu.ft. holder, and installation of compressing plant, is that purification is carried out at the coke ovens. The Author explains that in the particular circumstances the advantages of this plan have far outweighed the expenditure on the necessary plant. Both installations are supervised by one chemist, and the gas is sold in large and small quantities to other distributors on the route of the mains. In the discussion Mr. Harold Davies mentioned that full purification of the gas at the ovens and the use of the leading main for distribution purposes along its entire route were policies which Chesterfield adopted fifteen years ago with subsequent marked benefit. In regard to mainlaying, Mr. McCrae speaks highly of the trench excavator used and of the effectiveness of the Stanton-Wilson joint—his observations in this connection being endorsed by Mr. Ralph Halkett in the course of the discussion. All kinds of unfavourable weather and other conditions had to be met, and the Author mentions that had they attempted to make ordinary lead joints the work would have taken twice as long to complete.

Naturally the question of stand-by plant was carefully considered, and at the present time a mechanically operated water gas plant by Humphreys & Glasgow is being erected. The capacity is 3¼ million cu.ft. a day, which will bring the total provision for water gas to 6 million cu.ft. a day; and to be instantly available the plant is equipped with a gas engine to operate one of the blowing fans.

Light and Heat for the Lonely

ONE of the national dailies, the *Daily Herald*, went into headlines one day last week, almost ecstatically, on the subject of "light and heat for all lonely homes." Our contemporary has discovered that a great drive is being made by national gas and electricity interests to supply the countryside with light and heating facilities equivalent to those available to town dwellers. Drastic recommendations are expected to be made, it is stated, by the Committee of Enquiry appointed by the Minister of Transport, to consider ways and means of reducing electricity distribution costs. In the meantime, while such costs remain in many cases prohibitive, gas companies throughout the country are taking advantage of the deadlock to convert all the potential customers of the grid into gas users. The gas undertaking, like their electricity counterparts, have hitherto been handicapped by the cost of putting down mains to isolated consumers. "Now, however, they are able to supply gas in bulk to any consumers, no matter how remote they may be from towns, as cheaply as their customers in urban areas."

The last sentence is quoted exactly from the daily paper news story, and the answer, of course, is Calor-Gas. From the rest of the story the reader gathers, among other things, that each container of the gas will supply the ordinary heating and lighting requirements of an average household for six to ten weeks; that all that is necessary is to connect the container with a rubber tube to an ordinary gas cooker or to pipes carrying the gas to any part of the house; and that, unlike ordinary coal gas, the Calor-Gas is not poisonous and has no odour.

Quite apart from the sting in the tail, we do not feel

that an article of this kind is particularly helpful to the Gas Industry. Calor-Gas is acknowledged to be a useful adjunct, in certain circumstances, to the normal business of gas undertakings, and it is known that a considerable number of them are taking it up. On the other hand, it can only lead to disappointment and possibly embarrassment if the impression is given to remote consumers that they can have a gas supply as cheaply as town dwellers, or if consumers who take a supply of the bottled gas believe that the cost will be the same if eventually the mains are brought to them.

We do not suggest for a moment that the news story was inspired by the sponsors of Calor-Gas; in fact it is likely to be as little helpful to them as to the gas undertakings which are working with them. It is only one more example of the unfortunate absence of any check on the accuracy of the lay Press when it tackles technical subjects.

Personal

The Directors of Coatbridge Gas Company have appointed Mr. J. D. MILLAR, J.P., as Vice-Chairman of the Company in succession to Mr. Robert Waterston, J.P. Mr. GEORGE BRAIDWOOD, the Engineer and Manager, who has been with the Company for over 25 years, has been elected a Director.

* * *

Alderman F. BRADLEY and Councillor J. EASTHAM have been appointed Chairman and Vice-Chairman of the Bury Corporation Gas Committee respectively.

* * *

A further name well-known in the Gas Industry, which may be added to those mentioned in last week's issue as having been elected to Parliament in the General Election, is that of Mr. W. R. DEMPSTER PERKINS, a Director of R. & J. Dempster, Ltd., of Manchester. He successfully contested the Stroud Division of Gloucestershire.

* * *

At a recent meeting of Buckhaven and Leven Gas Board Bailie NAIRN, of Buckhaven, was appointed Chairman, Bailie THOMSON was appointed Finance Convener, and Mr. DYKES, Works Convener.

Obituary

The death occurred on Nov. 11 at Smethwick of Mr. VINCENT HUGHES, previously Gas Engineer at that town. Mr. Hughes was the oldest member of the Midland Association of Gas Engineers and Managers, having joined in 1882. He was also a P.M. of the Murdoch Lodge and held the office of Almoner.

* * *

We regret to announce the death of Mr. T. HANDEL, Senior, on Nov. 23. He was appointed Manager of the Ilminster Gas Light, Coal, and Coke Company, Ltd., in March, 1888, and was Managing Director when he retired in August of last year after 46 years of service. The splendid Works and progress made by the Company are largely due to Mr. Handel.

Statistical Methods and Industrial Standardization

How is the manufacturer, who takes tests at regular intervals, to judge from these tests whether the technical processes of manufacture are remaining under proper control? How is the consumer to determine that the material he buys complies with the tests laid down in clauses of a specification? These questions are dealt with in a publication (No. 600-1935) issued by the British Standards Institution, written by Prof. E. S. Pearson, of the Department of Applied Statistics, University College, London, in co-operation with a committee of men engaged in practical industry.

The main object of this publication is to set out as clearly as possible for the industrialist no less than for the statistician why statistical technique is needed and what kind of assistance it can give.

Illustrations have been taken from the testing of coal and engineering products, &c. Many diagrams are given, also a number of specially prepared tables published for the first time to assist in calculations required in the solution of the problems discussed.

Copies of this new British Standard publication (No. 600-1935) can be obtained on application to the British Standards Institution, 28, Victoria Street, London, S.W. 1, price 5s. 6d. post free.

Forthcoming Engagements

Nov.

29.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m.
29.—SOUTHERN ASSOCIATION.—General Meeting at the Hotel Metropole at 2.30 p.m.
29.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. W. Grogono, of Croydon.
30.—NORTH OF ENGLAND G.M.A. (AUXILIARY SECTION).—Meeting at Newcastle-on-Tyne and Paper by Mr. D. Yule.

Dec.

2.—WOMEN'S GAS COUNCIL.—Executive Committee, 2.15 p.m., at 28, Grosvenor Gardens, S.W. 1.
3.—I.G.E.—Research Executive Committee, 2.30 p.m.
4.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Visit to Birkenhead. Paper by Mr. A. J. Walker.
5.—MIDLAND JUNIOR ASSOCIATION.—Annual Dinner.
7.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Meeting at Arbroath.
11.—B.G.F.—1st Annual General Meeting, Grosvenor House, Park Lane, London, W. 1, 3 p.m.; 2nd Annual Dinner, Grosvenor House, Park Lane, London, W. 1, 7 p.m.
11.—S.B.G.I.—Council Meeting, 11.15 a.m.
11.—I.G.E.—Finance Committee, 9.30 a.m.; Membership Committee, 9.30 a.m.; General Purposes Committee, 9.30 a.m.; and Council, 11 a.m.
13.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Paper by Mr. L. Friedman, of Ascot Gas Water Heaters, Ltd.
14.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Meeting and Address by Mr. W. D. Rowe, of the B.C.G.A.
14.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—Meeting at Cardiff. Paper by Mr. B. J. Bell.
14.—WESTERN JUNIOR ASSOCIATION.—Meeting at Torquay. Paper by Mr. J. W. Denton, of Torquay.
21.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Annual Social.

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11.—SCOTTISH JUNIOR ASSOCIATION.—Joint Meeting in Glasgow. Address by Mr. H. C. Smith.
16.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. B. Green.
18.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bath. Paper by Mr. F. G. O'Neill.
18.—YORKSHIRE JUNIOR ASSOCIATION.—Meeting at Oldham. Paper by Mr. R. E. Stott.
24.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. T. A. Wolfe.
25.—WALES AND MONMOUTHSHIRE JUNIOR ASSOCIATION.—Meeting. Paper by Mr. C. F. Petersen.

Feb.

6.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. G. C. Pearson.
8.—MANCHESTER AND DISTRICT JUNIOR ASSOCIATION.—Meeting at Darwen. Paper by Mr. J. A. Derbyshire.
8.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Meeting.
14.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Dr. F. J. Dent.
15.—SCOTTISH WESTERN JUNIOR ASSOCIATION.—Annual Social.
15.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Meeting at Perth.
15.—YORKSHIRE JUNIOR ASSOCIATION.—Short Paper Meeting at Bradford.

News in Brief

Running on Town Gas, no fewer than 37 commercial motor vehicles now ply the streets of Hanover, states a German contemporary.

Extensive Damage was done by window slashers on Nov. 20 to the plate-glass windows of the Manchester Corporation Gas Department's showrooms in Deansgate.

The London Office of the Leipzig Fair is now in rooms 426 to 428 on the third floor of First Avenue House, High Holborn, W.C. 1. Telephone numbers: Holborn 1408 and 1409.

Gas Lighting is to continue in the Wanstead-Woodford Urban District, Essex, where the Council has entered into a seven-year contract with the Gas Light and Coke Company.

Mr. G. W. Broughton, Engineer and Manager to the Heywood (Lancashire) Corporation, gave an Address on gas at the weekly meeting of the Heywood Rotary Club on Nov. 20.

New Showrooms have been opened by the Blackrod (Lancashire) Gas Company at New Street, Blackrod, and to celebrate the opening a washing demonstration is being held from Nov. 25 to 30.

During the Celebrations this week of the centenary of the birth of Andrew Carnegie at Dunfermline the Carnegie Statue in Pittencrieff Park is being floodlighted by the Dunfermline Gas Department.

Sir Francis Goodenough, C.B.E., on Nov. 18 distributed prizes to and addressed the students of the Burnley Municipal College and School of Art, when over 2,000 students were present, many of whom were employees of the Burnley Gas Undertaking.

Mr. N. G. Wilson, Inspector of Cleansing and Lighting to the Edinburgh Corporation, recently addressed the Edinburgh Rotary Club on the subject of "Street Lighting." Dealing with the relative merits of gas and electricity for street lighting, Mr. Wilson said gas was not the spent force for street lighting which some people fondly imagined it to be.

Application for a Special Order is intended to be made to the Board of Trade under the Gas Undertakings Acts, 1920 to 1934, with the object *inter alia* of extending the existing limits of supply of the Leicester Gas Department. We understand that the Corporation intends taking over the Undertaking of the Syston and Thurmaston Gas Light and Coke Company.

A 10% Increase in Birkenhead's gas consumption during the last twelve months was announced at the opening of an exhibition of gas appliances at Bebington. As a result of the exhibitions arranged by the Corporation Gas Department, there had been 7,000 appliances sold, to the value of £40,000, as compared with 1,730 appliances, to the value of £11,000 last year.

A Broadcast from the Provan Gas-Works of the Glasgow Gas Department is being given to-morrow night at 7.30 p.m. in the Scottish Programme [391·1 metres] by the B.B.C. This is the fourth broadcast in the series "Made in Scotland," and will take the form of a running commentary and interviews with the officials and staff of this modern Gas-Works. The commentator is Mr. P. I. Keith Murray.

Mantles by Post is the latest service started by the South Metropolitan Gas Company, who this week announce that "Metro" gas mantles can be obtained by post at 7d. each, post free, and charged against monthly gas accounts. Special containers are used to ensure safe transit and 1d. will be allowed on all containers returned in good condition. The mantles, in all the usual domestic burner sizes, are available from the Stores Department at 709, Old Kent Road, S.E. 15.

The Electricity Supply Failed at Stretford last Wednesday evening. Work at Stretford Town Hall was temporarily interrupted, work in the offices at Stretford Baths had to be continued by candle light, and although there was a stoppage at Stretford Memorial Hospital, no inconvenience was caused to the staff as fortunately no operation was in progress at the time. Another effect of the breakdown was to cause a stoppage of trams on the Deansgate to Stretford route for some time.

In the Engineering Supplement to the *Western Mail* for Nov. 20, Sir Francis Goodenough, C.B.E., Chairman of the B.C.G.A., contributed an article on the heat treatment of steel by town gas. Good publicity was also secured for gas by advertisements for the Industrial Gas Research Centre for South Wales and for gas as an easily controlled fuel for industry, prepared by the B.C.G.A.

An Action against the Stonehaven Gas Company, Ltd., on Nov. 20 for alleged injury and damage received from a leakage of gas failed at Stonehaven Small Debt Court. Miss M. A. Thomson, of Cameron Street, stated that a gas pipe laid opposite her house was in a defective state, and, on March 20, gas percolated through the earth, entered her house, and poisoned her. Medical evidence supported this statement. The Company repudiated liability, evidence being given that a steam roller had been at work on that section of the road. Sheriff Dallas found for the Company. The pipe had done its work until interfered with by the steam roller. As far as he knew there had never been any guarantees demanded from undertakings to the effect that, if there was interference with their pipes resulting in an escape, they were necessarily bound to assume responsibility.

British Gas Federation

We are informed by the Secretary of the Dinner Committee of the British Gas Federation that the number of Acceptances for the Second Dinner of the Federation at Grosvenor House, London, on Dec. 11, 1935, has reached 700, and is already in excess of the attendance (666) at the Inaugural Dinner last year.

Applications for tickets received after Dec. 2 next, will not be in time for inclusion on the printed table plan.

Association of Public Lighting Engineers

Among the new Members and Associates elected by the Association of Public Lighting Engineers are the following:

Members.

Mr. J. H. PATERSON, Manager, Ludlow Union Gas Company, Ludlow, Shropshire (responsible for Public Lighting of Ludlow and Tenbury).

Mr. T. T. RADFORD, District Manager, Gas-Works, Tamworth (Public Lighting Engineer).

Junior Members.

Mr. H. W. LODGE, Street Lighting Foreman, Burnley Corporation Gas Department.

Associates.

Mr. J. R. W. ALEXANDER, Secretary, The Institution of Gas Engineers.

West's Gas Improvement Company, Ltd.

Change of Address of London Office

On the expiration of the lease of West's Gas Improvement Company, Ltd., at Regent House, the firm have taken the opportunity of moving their London Office to new and more commodious quarters. From Dec. 1 the new address in London will be:

WEST'S GAS IMPROVEMENT COMPANY, LTD.,
Columbia House,
Aldwych, London, W.C. 2.
Telegrams: "Wesgasco," Estrand, London.
Telephone: Holborn 4108.

It will be seen that the telephone number remains unaltered, but that the telegraphic address is altered to "Wesgasco," Estrand, London.

Electrical Damage to Pipes

By the inquest held after a recent tragic fire in London, attention has again been focussed on the risks of damage to gas pipes by electrolysis. Readers who wish to refresh the memory on this subject are reminded of two well-known "JOURNAL" publications, full particulars of which will be found on page 656.

New Capital Issues

A number of new capital issues, either proposed or allotted, are recorded this week, which indicate the high regard in which gas stocks are held in all parts of the British Isles and the readiness of the public to invest their money in the undertakings of the Gas Industry.

Alliance and Dublin Consumers' Gas Company.

The Alliance and Dublin Consumers' Gas Company is offering for sale by tender such an amount of Consolidated Ordinary Stock as, with premiums, will produce £300,000.

The Company has a large area of supply, and its consumers number 105,000. Since 1922, sales of gas have risen from 6½ million to over 12 million therms per annum, this remarkable increase being to some extent attributable to the development of housing schemes in Dublin and neighbourhood. Considerable consequential capital expenditure has been necessitated, and, the Company having raised no new capital for twenty-five years, the capital account is now over-expended by £291,000. The new issue is intended to liquidate this over-spent balance, but it will leave cash resources of about £100,000 out of which to meet the Company's ever-expanding business.

The new issue will exhaust the Company's powers to raise capital by the creation and issue of consolidated ordinary stock, but there still remains to be borrowed an amount of £100,000 of 4% perpetual debenture stock. Capital, in relation to sales of gas, compares very favourably with that of the largest gas undertakings.

The Company operates on the sliding scale system, that is, the dividend varies inversely according as the price of gas is above or below the standard price. Recent dividends have been at the rate of 7%. The stock has remained steady in the neighbourhood of £140 for some time past. At this price, a 7% dividend would return the excellent yield of 5%.

Investors resident outside the Free State are reminded that under existing arrangements they can obtain a refund of the whole of the Irish Free State tax deducted at source, and that they will be liable only to British tax. The present issue is officially quoted at London, Liverpool, Manchester, Dublin, and Cork, and there is a ready market for the stock. Permission to deal in the new issue will be applied for.

United Kingdom Gas Corporation, Ltd.

The subscription list was opened and closed on Tuesday, Nov. 26, for an issue of 600,000 4½% cumulative preference shares of £1 each at 21s. per share and 250,000 ordinary shares of £1 each at 22s. per share. The 600,000 cumulative preference shares will rank *pari passu* in all respects with the 310,910 preference shares already issued except that the first dividend will be paid on June 1, 1936, and calculated on the amounts payable on application and allotment (exclusive of premium) from the date of allotment and on the remaining instalments from their due dates of payment. The 250,000 ordinary shares will rank *pari passu* in all respects with the 500,000 ordinary shares already issued except that they will rank for dividend only from Dec. 31, 1935.

Derby Gas Light and Coke Company.

We learn that the issue of £100,000 of 4% redeemable debenture stock recently offered by the Derby Gas Light and Coke Company was subscribed more than seventeen times over.

It is of interest that this issue was practically all taken up by local gas consumers. Altogether applications were received for £1,715,800, and all applications received for amounts up to £100 were allotted in full, preference being given to employees, consumers, and existing shareholders.

Ascot District Gas and Electricity Company.

The tenders sent in for the £24,000 4% perpetual debenture stock, which were offered on behalf of this Company by Messrs. A. & W. Richards, of 37, Walbrook, E.C. 4, were opened on Nov. 21. They amounted to a total of £150,850, at prices ranging from £107 10s. per £100 down to the minimum of par. The lowest accepted tender was at £104 1s. per £100, and the average price obtained was £104 12s. 2d. per £100.

Gas Aids Electioneering

Though we are unfortunately unable to show this illustration in its actual colours, we are assured that gas played an important part in making this striking elect on poster more effective. Under the existing "Osira" electrical street lighting the candidate's name on the poster outside his headquarters bore a strange and unintended tint. The Tottenham and District Gas Company were called in, and under the powerful illumination of the gas lamps seen in the photograph, the poster again assumed its natural hue. Indeed, perhaps one may say that the candidate was once more shown up in his true colours.

Large Coking Plant for Jarrow

We learn from the Koppers Coke Oven Company, Ltd., that Messrs. John Bowes & Partners, Ltd., of Newcastle-on-Tyne, have placed with them a contract for a new coke oven and by-product plant, to be erected on a site adjacent to their private railway near Jarrow. The installation will carbonize 200,000 tons of coal per annum, and will produce special foundry coke of the well-known Marley Hill quality. Arrangements have been made, they state, with the Newcastle & Gateshead Gas Company for them to take the surplus gas from the ovens.

The coke oven installation will consist of 33 Koppers combination circulation ovens with cross-over regenerators constructed so as to permit of their being fired by low-grade gas if this is required in future. Complete coal handling plant is included, with blending bunker and service bunker of 1,000 tons capacity each, together with coke handling and grading plant. The by-product installation is to be of the latest Koppers type, including the most advanced practice in the production of fine benzole and high-grade tar.

It is expected that the installation will be in operation during the early part of 1937. Special arrangements have been made for as much work as possible in connection with the contract to be carried out in the North-East Coast area.

In connection with the construction of this plant, Messrs. John Bowes & Partners have, we learn, placed with the Birtley Company, Ltd., the contract for a complete coal washery with coal handling plant. The installation will comprise the lastest type of Birtley washers, and will also include a battery of concentrating tables for washing fine sizes of coal. The Birtley-Henry system of water clarification will be adopted, in order to ensure that there shall be no dirty effluent from the plant. Large bunker accommodation is provided, and the coal will be intimately mixed with dry coal and used for coking purposes.

Reconstruction Scheme for Dundee

Vertical Retort Improvements

A reconstruction scheme at the Dundee Gas-Works costing £34,609 was approved by the Gas Committee on Nov. 19. Mr. Robert Loggie, Interim Convener, said this was a big scheme, which had been in the minds of the Engineer and Manager, Mr. John Wilson, and himself for some time. The retort house, which at present held 20 vertical retorts, was to hold 30 by the use of a new arrangement. With 30 retorts they would be able to do away with their horizontal retorts, which would mean a great benefit to the gas-works, as far as inland revenue charges were concerned. He understood that the obsolescence of these horizontal retorts would mean that about £8,000 saved on income-tax might go to meet the cost of the new retorts.

The Engineer and Manager suggested that £13,000 of the cost should be taken from the reserve fund, which stood at £26,000. The balance of £21,609 is to be included in the capital estimates for next year.

Church Floodlighting By Gas

Churches continue to be a favoured medium for floodlighting by gas. A recent example of this form of illumination was the floodlighting of the beautiful 14th Century Church of St. Michael at Minehead. Situated on a hill overlooking the town, this Church, with its 87-ft. tower, provides a prominent landmark by day, and was visible for miles around during the floodlighting period. Mr. E. V. Dunn, Engineer, Manager, and Secretary of the Minehead Gas Light and Coke Company, who supervised the installation and arrangement of the floodlighting units, is to be congratulated on the very fine result. He was assisted by Mr. A. E. Jones, of Messrs. W. Parkinson & Co., thirteen Parkinson 10-light upward-beam alignment floodlight lamps, and three projector units being employed.

Town Hall Heated by Gas

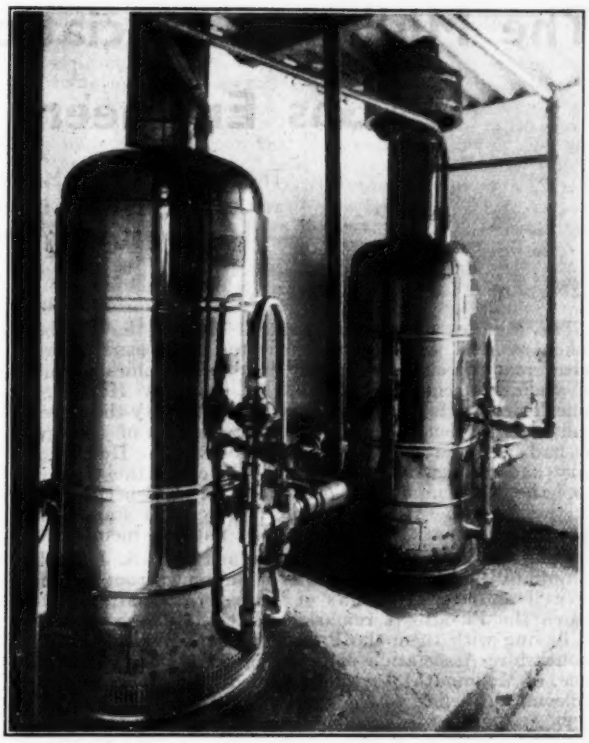
Croydon Company's Large Installation

Once again the suitability of gas for heating large buildings has been demonstrated by an installation recently carried out in the Croydon Gas Company's area.

A new Town Hall has recently been erected for the Beddington and Wallington Urban District Council, and the heating of the entire building has been effected by means of two No. 2 series 7-section "Rex" boilers by Thomas Potterton. These boilers have a maximum gas consumption of 2,520 cu.ft. per hour, and, in addition to heating the radiators placed in the various corridors, offices, &c., they also raise the temperature of cold air induced into the Council Chamber over a battery of heating fins. An electrically-operated accelerator is fitted to the main return pipe of the boilers, which enables the water to circulate around the building in twenty minutes, thus reducing the time taken for the air to attain the required temperature. Radiating panels are built into the walls, finished to match the decorations, and emit both radiant and convected heat.

The hot water supply for the lavatory basins is drawn from a 300-gallon hot water storage cylinder connected to four No. 2 "Empire" thermostatically controlled boilers by the same firm, having a maximum hourly consumption of 320 cu.ft. These boilers are capable of heating 300 gallons from 60° F. to 140° F. in about two hours.

Well-known Football Club Relies on Gas



Our photograph shows the Ewart's "Califonts" which have been installed at the Preston North End Football Club to supply hot water to two plunge baths—each capable of holding 1,000 gallons of water—and a number of lavatory basins. This type of heater is stated to provide, without storage, an immediate and continuous supply of hot water at the rate of 16 gallons per minute (raised 40° above cold). The temperature can, of course, be regulated as required, and the gas consumption at the specified output is at the rate of 16 cu.ft. per minute.

Giant Melting Plant

A couple of giant foundry cupolas were last week in course of transit from Birmingham to Middlesbrough. Each cupola, when erected, will be approximately 60 ft. high, the shell diameter being 8 ft., and the air belt diameter 10 ft. They have been built by the Constructional Engineering Co., Ltd., of Charles Henry Street, Birmingham, and are of special construction for the Stanton Iron-Works foundry, where they are to be used for continuous melting in connection with the manufacture of cast-iron pipes. With one exception, they are believed to be the largest cupolas to operate in this country. The transport of this plant necessitated special arrangements being made by the railway companies concerned, more especially in connection with single-track working from Normanton to Middlesbrough, and the two cupolas are the largest consignment of melting equipment handled by the railways for some years. Our photograph shows the air-belt section of each cupola loaded on railway trucks ready for despatch.

The Midland Association of Gas Engineers and Managers

Autumn Meeting in Birmingham.

The Autumn General Meeting of the Association was held at the Imperial Hotel, Birmingham, on Thursday, Nov. 21 — the President (Mr. Arthur Roberts, of Hereford) in the chair.

The Minutes of the last General Meeting having been taken as read, and duly signed, the PRESIDENT referred with great regret to the loss by death of the oldest member of their Association—namely, Mr. Vincent Hughes, of Smethwick. He had been a member for fifty-three years and was President in 1910, while for a number of years past he had been one of their Hon. Members. The Hon. Secretary had written a letter of condolence to the relatives, while he and a number of other members had been present at the funeral. He asked those present to stand for a moment as a mark of respect to Mr. Hughes' memory.

The HON. SECRETARY AND TREASURER (Mr. S. J. Sadler, of Solihull) announced apologies for absence from members as well as from Presidents of kindred Associations, after which the PRESIDENT remarked that they were fortunate in having with them the President of the Wales and Monmouthshire Association of Gas Engineers (Mr. H. Matterface, of Monmouth), and he extended to him a very hearty welcome on behalf of the members.

The following two applicants for membership were then elected by ballot to the Association—namely, Mr. H. Wynne (Burton-on-Trent) and Mr. G. M. Gill (Director, Severn Valley Gas Corporation).

On the proposition of the PRESIDENT, seconded by Mr. H. J. WOODFINE (Wellington), Mr. J. R. Duff (Banbury) was unanimously elected to Hon. Membership.

Thereafter certificates were presented by the President to successful candidates in the Higher Grade Examinations in Gas Engineering and Gas Supply. The complete list of successful candidates is as follows:

Gas Engineering (Internal).

H. L. Fielder	Birmingham	1st Class
J. A. Tomes	Walsall	,,
W. F. Caton	Oxford	2nd Class
K. E. Chambers	Redditch	,,
E. A. Gibbins	Leicester	,,
T. W. Roberts	Dudley	,,
J. H. Stafford	Coventry	,,

Gas Supply (Internal).

S. F. Allsopp	Quinton	1st Class
G. A. Blackwell	Birmingham	,,
R. R. Crump	Smethwick	,,
J. E. Jukes	Dudley	2nd Class
E. W. Pickering	Syston, Leicester	,,
N. R. Reilly	Birmingham	,,
R. L. L. Robinson	,,	,,
R. A. Westwood	,,	,,

Gas Supply (External).

A. J. Winter	Nottingham	2nd Class

New Officers and Committee.

The PRESIDENT then moved that Mr. G. S. Eunson be elected his successor in the presidential chair for the ensuing year. There was no one more fitted to take the office of President.

This resolution was seconded by Mr. F. C. BRIGGS (Dudley), who remarked that they were very pleased indeed to see Mr. Eunson taking this prominent part in the affairs of the Association.

The resolution was carried unanimously, and Mr. EUNSON, in acknowledging his election, thanked them sincerely for the honour they had done him. He was very proud to be in this position, and he regretted he had not been able to become a member of their Association earlier, because he had been handicapped by not being able to keep in touch with other gas engineers in his district. He would do everything in his power to forward the interests of the Association, which had done so much in the past, and would, he felt sure, do equally well in the future.

Mr. BRIGGS said he had pleasure in moving that Mr. Harold Davies, of Chesterfield, be elected Vice-President of the Association. Mr. Davies was well-known to all of them, and it needed no remarks of his to recommend him to them.

Mr. EUNSON seconded the proposition, which was carried unanimously, and Mr. DAVIES briefly returned thanks for his election.

The following members were elected to the Committee: Mr. C. C. Sidaway (Droitwich), Mr. E. D. Wootten (Malvern), and Mr. J. Mitchell (Leicester).

Mr. J. H. Rioch (West Bromwich) and Mr. J. H. Wainwright (Halesowen) were elected as the Auditors of the Association for the ensuing twelve months.

New Secretary and Treasurer.

The PRESIDENT said that they greatly regretted that Mr. Sadler was unable to continue in the office of Hon. Secretary and Treasurer. The good work he had done in this capacity was well known to all of them, and they had tried to persuade him not to relinquish the position. His duties at Solihull, however, had become so onerous that he was unable to carry on the Secretaryship. In his place, Mr. J. H. Paterson, of Ludlow, had kindly agreed to accept the office.

Mr. Paterson was unanimously elected Hon. Secretary and Treasurer on the proposition of Mr. J. BRETTLE (Lower Gornal), seconded by Mr. F. DAVIES (Walsall).

A Paper on the subject of Derby's Coke Oven Gas Supply was subsequently read by Mr. J. P. McCrae, Chief Engineer of the Derby Gas Light and Coke Company, and this, together with a report of the discussion which followed, will be found on later pages of this issue of the "JOURNAL."

Hydrogenation of High-Temperature Tars

Last week we published the Paper on this subject given by Dr. C. M. Cawley to the Western Junior Gas Association. The following is the Author's reply to the discussion:

Dr. Cawley said he did not agree that the outlook for the hydrogenation process was black. It had been stated that spirit could be produced at 7d. per gallon; this left a fair margin of profit under the existing preference. For economic working, the process must be operated on a large scale.

Hydrogen might be produced from water gas by treatment with steam at about 400°-600° C. in the presence of an iron catalyst. It was also possible to manufacture hydrogen from the hydrocarbon gases produced in the process; treatment with steam at 800°-1,000° C. over a nickel catalyst gave a mixture of carbon monoxide and hydrogen which was then treated in a manner similar to water gas. It was suggested that this method of making hydrogen for the hydrogenation process might become standard practice.

Dr. Cawley said he had no information about Calor Gas. The hydrocarbon gases produced during hydrogenation consisted mainly of methane, ethane, propane, and butane.

The catalyst used in liquid-phase hydrogenation was introduced dispersed in the tar, but the amount was so small that it was not separated in normal practice. This had, however, been done on occasions by centrifuging. Free carbon had been referred to in the sense usually accepted in tar works—namely, as denoting that portion of the tar insoluble in toluene. Much of this material was not elemental carbon, but condensed and polymerized hydrocarbons.

They had not treated tar from steamed horizontal retorts,

but tests in the Laboratory showed it to be between vertical and normal horizontal retort tar in behaviour.

In reply to Mr. Jones, Dr. Cawley said that the yield of spirit depended upon the time of contact; the oil boiling above the motor spirit range in the product was not a refractory material, and if re-cycled gave similar results to those obtained with the original raw material.

The reaction-temperature control had given some difficulty, but this had now been overcome; about 75% of the catalyst bed was kept at 480° to 500° C. which was the temperature for the treatment of low-temperature tar.

Regarding high-paraffin tars, they had found that paraffin wax passed through the process unchanged, but experiments had not been undertaken on water-gas tar.

The Season's Range of Cannon Fires

New List Issued

The new season's catalogue of gas fires recently published by Cannon Iron Foundries, Ltd., of Deepfields, near Bilston, Staffs., is an attractive and well set out production, containing a full range of this firm's well-known heating appliances.

An introduction clearly sets forth the advantages claimed by the firm's inclined design of gas fire as compared with the upright type, while the distinctive features of the "Vitaglo" radiants are also explained. Following some useful tables of heating capacities and gas consumptions, there are some notes on the fitting of these fires, after which the catalogue goes on to deal in detail, with full specifications and illustrations of the various models. Most notable of these is the "Veronica" fire, which embodies an automatic lighter operated merely by turning on the gas in the usual way. This model also incorporates a new design of radiant. The "Veronica" fire is stated to be an improvement upon the earlier inclined fires. Not only is the "up and down" heat correctly distributed, but the "side to side" distribution is similarly improved. The inclined radiants are stepped back from the centre radiant, with the result that more heat is radiated sideways than from a flat-fronted fire. One may sit right to the side of a "Veronica" fire and still be warm.

The publication goes on to illustrate the various pleasing coloured finishes in which Cannon fires may now be obtained, a choice of six main colours, together with silver and gold paint finishes, being available. Details are also given of the firm's well-known "Beacon" radiator, their inset models, the "Portray" portable heater (which has a maximum consumption of 12 cu.ft. per hour), various other types of gas radiators with a table of their capacities, and a section on gas fire accessories, such as iron elbows, flue piping, &c. It is altogether a well produced and useful addition to the Industry's lists of appliances in connection with the heating load.

Midland Junior Gas Association

Lecture on Street Lighting

At a meeting of the Midland Junior Gas Association held at the Gas Offices, Birmingham, on Nov. 7, Mr. R. G. Marsh (Fittings Superintendent of the City of Birmingham Gas Department) gave a talk, illustrated with lantern slides, on the "Birmingham High-Pressure Street Lighting Installation."

Mr. Marsh gave details of the installation of the high-pressure lighting in New Street and Corporation Street, Birmingham, and outlined the difficulties met with. An illustrated description of this installation, by the same Author, was published in the "JOURNAL" for Nov. 21, 1934.

Mr. F. A. PYKETT (Coventry), in proposing a vote of thanks, said that it had been a most interesting talk and he had no adequate words in which to express his admiration for the work entailed by such a wonderful scheme of lighting. Mr. Marsh's name had been known throughout the country for many years, and in connection with this scheme of lighting—which was one of the finest in Europe—his name would become even more widely known. The way in which the many difficulties encountered had been overcome was truly remarkable. He, personally, had had some small experience with high-pressure lighting, but had not yet been able to obtain a high-pressure gas lamp which was stormproof. On a really wet day with a gale blowing, they experienced in Coventry considerable trouble, as water got inside the lamp and they had to renew the mantles. Speaking of mantles, he had found that two types could be obtained—one giving a white light and another a yellow. He liked the white light better, but he understood that the mantle giving a yellow light was better in foggy weather. Considerable trouble had been experienced in regard to globes, and he had not yet been able to get an English-made globe to compare with those of foreign manufacture. In Coventry they always endeavoured to buy British goods, but they had been compelled to buy a foreign globe for high-pressure lighting. He was particularly interested in the air box in the lamp described by the speaker, as the thermostat in use at Coventry was not particularly satisfactory. Considerable difficulty was also met with in regard to the brass nozzles. A composite nozzle had been tried, but owing to the difference in the expansion of the two metals the composite portion became loose.

Mr. F. A. JENKINS (Leamington), who seconded the vote of thanks, said that in explaining the difficulties experienced in bringing into being the wonderful example of public lighting, Mr. Marsh had referred to things "going along like clockwork," and this was a fine testimony to the excellent staff work. The tests carried out on the breaking points of various materials used had provided valuable data which no doubt would be useful in connection with other work.

The vote of thanks was carried with acclamation.

Mr. S. BROCKBANK (Walsall) said that it was evident that very much staff work had taken place for a considerable time before any constructional work was carried out, and it was no doubt due to this forethought that the whole installation had proceeded so smoothly. He referred to the very remarkable method adopted to overcome leakage from the cock and asked what happened in regard to the leakage when the lamps were alight. He also enquired as to the consumption per lamp.

Mr. E. T. PICKERING (Birmingham) said that Mr. Marsh's thoroughness and belief in experiment had very much impressed him. He thought that if more experiments were made generally, there would be fewer mistakes and less cause for regret afterwards. He had read in the Press comments on the unsatisfactory nature of street lighting, and if these comments were a means of detracting from the use of gas for that purpose, then the value of the installation described would be extreme.

Mr. A. J. WARD (Redditch) asked how the maintenance cost of the installation compared with a similar installation of electric lighting.

The Author's Reply.

Mr. MARSH, in reply, said that the very high winds and bad weather which had been experienced lately had provided a severe test for the new installation. No difficulty had occurred through rain getting into the lanterns, but the high winds had blown the lanterns out of perpendicular and in a few instances had caused them to move on the ball joint. This had only occurred, however, to the lamps fixed to columns and had not affected those suspended on cables.

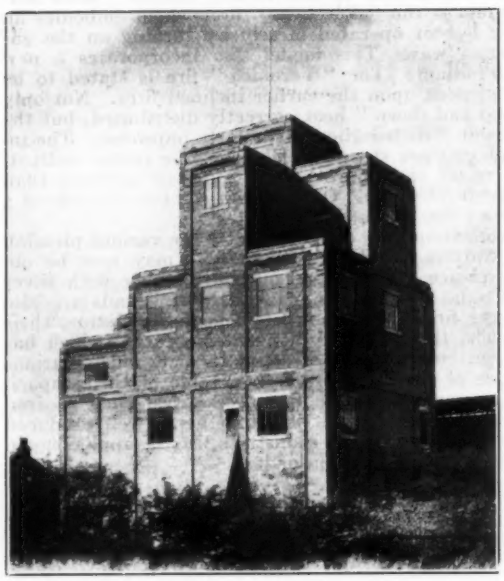
With regard to mantles, they had wanted a good maintenance figure on the installation, and therefore had adopted mantles smaller than usual. The life of this type had proved to be about 60 days, which was a satisfactory figure. In regard to the colour of the light, there were a lot of people who thought that yellow discs on motor headlights gave a better fog penetration, but in his opinion there was no foundation for that belief. The globes used were of British manufacture.

He was familiar with the air thermostat referred to by Mr. Pykett, and because of previous experience with it he had introduced the automatic regulator which enabled gas to be turned off very slowly. Difficulty had been experienced in regard to the metals from which the nozzles were made, and the heaters of the lamps were now bushed with nichrome and tungum nozzles fitted.

The difficulty referred to in connection with the magnetic fog lighting attachment had been overcome in a very ingenious manner. The cam had been fitted with a light spring so that it flew back out of the way when the discharge lever was lifted, and so the lamp remained alight until the proper time for turning out.

With regard to the plugs, the gas leakage was taken to the pilot light whether the lamp was on or off, because the pilot light was always burning. The lamps consumed 80 cu.ft. per hour. He regretted that he was unable to give the cost of maintenance as compared with electricity, as he did not know of any electrical installation which was comparable.

Drakes' Vertical Retort Installation



The New Retort House at Ilkley.

INAUGURATED

at Ilkley

An installation of vertical retorts by Drakes, Ltd., of Halifax, erected in a building which admirably harmonizes with the natural beauty of the district, was formally inaugurated last Thursday at Ilkley.

The site on which the Drakes vertical retort installation has been erected is adjoining the existing retort house, and is built on mass foundations.

It will be realized that in the erection of a building of a height necessary to accommodate a modern vertical retort installation in a district such as Ilkley, one of the beauty spots of the Yorkshire Dales, and a resort patronized by visitors from all parts of the country, it was very essential that the structure and design of the retort house should be developed in a manner to suit the amenities of the surrounding district. This factor had been taken into consideration by Drakes, Ltd., in submitting their designs for the contract, and the present building is the result of such design, coupled with a great deal of thought and many deliberations in conjunction with the Gas Sub-Committee.

The natural building material of this area is stone, but the cost of such material for a building of this description would be prohibitive. It was, therefore, decided that concrete blocks formed of a mixture to compare as favourably as possible with the local stone should be utilized for filling in the structure. Iron moulds were made for the purpose of moulding the blocks to the various sizes required to form a proper bond and fit into the web of the steel structure and were manufactured by Messrs. A. Dewhirst & Sons, a local firm. It will be observed that the blocks are all made to resemble a pitched stone face. The heads and sills are also of concrete of a different mixture, to form a contrast, and are reinforced with bar iron, the whole of the work being jointed with cement compo.

The building is exceedingly well lighted by specially designed steel framed windows of varying sizes to harmonize with the structure of the building, and efficiently diffuse the light to all parts of the plant. The individual flat roofs forming the covering of the building are constructed of rolled steel joists with a concrete filling, and waterproofed by a series of layers of bitumastic material, suitable ventilators being provided. The walls of the building are extended to form a parapet, and the fall pipes are all arranged inside the house. A notable feature is the entire concealment of the chimney. The structure of the building is formed of steel joists and channels with the necessary bracing members, the concrete blocks being 4½ in. thick.

The result is a commodious house for the accommodation of the vertical carbonizing plant and coke plant, of a pleasing character which blends with its surroundings, and has excited favourable comment from the Ilkley Preservation Society, a body of comparatively recent formation, whose object is the preservation of the beauty spots in the district.

Carbonizing Plant.

The new carbonizing plant comprises three settings of Drakes' patent continuous vertical retorts, draughted on their upward system of heating. Each setting contains 2 retorts in units of one, each chamber being provided with an independent gas and air supply with dampers and regulators grouped in the most convenient and accessible positions which permit of the temperatures of the settings being easily regulated to suit the varying throughput to meet the seasonable demands for gas. Sufficient space is left for a further extension of two additional retorts.

The retorts are Drakes' 54 Model, and are constructed throughout the entire heating zone of Meltham toughened silica material, the combustion chamber and setting linings being of the same quality material. Each retort has a guaranteed throughput of five tons of coal per diem.

All the setting walls are insulated with Moler non-conducting bricks, and sight boxes are arranged in the front walls at frequent intervals to permit of proper inspection of the temperatures throughout the length of the retorts.

The producers are arranged on the ground floor at the front of the settings, and are of ample capacity and fitted with Drakes' step grate for large area, with provision for burning a percentage of the breeze in the producers.

The firebrick material used in the construction of the producer and settings is of the highest quality and supplied by Messrs. John Morton & Co., of Thornton, Bradford.

The coke chambers and extractors are of Drakes' standard design, the discharging doors being of the self-sealing pattern.

The throughput of each retort is separately controlled by a ratchet and mask device. Superheated steam is admitted into each retort through a specially designed fitting for the purpose.

The top end of the retorts is surmounted by a cast-iron mouthpiece, to which is attached the coal feeding hopper and the gas off-take pipe, and fitted with a filling door of ample size, each gas off-take pipe having an adjustable gas-tight valve.

Collecting mains are arranged above the settings and receive the gas from each retort, and are provided with drain pipes for dealing with and separating the tar and liquor. Each gas collecting main is connected to the foul main by means of a vertical pipe, fitted with inspection windows and sprays for washing and cooling the gas, the liquor being continuously circulated by means of Evan's Cornish direct-acting steam pumps in duplicate.

The governing of the gas is accomplished by means of a 9 in. Arca retort house governor, assembled in a convenient position on the charging platform. A notable feature is the charging platform, which is exceedingly spacious, efficiently lighted, and remarkably cool, permitting the men to carry out their duties in an atmosphere of comfort.

One sectional roof is arranged at a similar level to the charging platform, which is accessible to the stokers, and allows of them enjoying their periods of leisure in the open air in the summer time.

Coal and Coke Handling Plant.

The coal is received from road vehicles in a receiving hopper built inside a concrete tank. The coal is fed from the receiving hopper through a jigger feed to the elevator boot. The elevator is Drakes' standard 18 in. bucket type, which delivers the coal into the storage hoppers over the retorts, having a capacity of 48 hours' supply. The eleva-

tor is driven by means of a Lancashire Dynamo Company's motor of 12 h.p., with suitable reduction gear, the current for the motor being supplied from the Works' existing generator set.

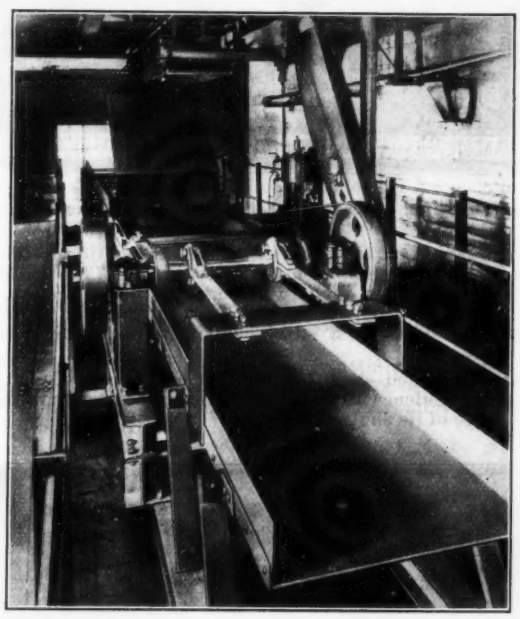
The coke breaking, screening, and grading plant is accommodated over the concrete hoppers, the whole structure being part and parcel of the main building.

The coke from the extractors is taken to the lift in bogies, and transported to a receiving hopper over the coke screens. At this point it is fed by a jigger feed, either through the breaker, or by-passed direct to the screens, which are of Drakes' improved " Zimmer " type, operated by eccentric roller bearings. The whole of the coke-screening plant is driven by a Babcock & Wilcox totally enclosed steam engine.

The concrete hoppers underneath the screens are divided into four compartments for breeze, nuts, domestic coke, and overs. The hoppers are fitted with bottom shoots to load the screened coke direct into road vehicles. A platform running the full length of the hoppers, together with shoots underneath the hoppers, facilitates the loading of the coke into bags. The capacity of the hoppers is approximately 140 tons.

Waste-Heat Boiler.

The waste gases leaving the combustion chambers of the carbonizing plant pass through a steel-cased insulated flue to a standard Spencer-Bonecourt waste-heat boiler, having a heating surface of 600 sq.ft. and a working pressure of 120 lbs., and is fitted with a " Sirocco " inducer fan, driven by a 2-h.p. Sisson steam engine. The boiler feeding arrangement consists of a Weir Duplex feed water pump.



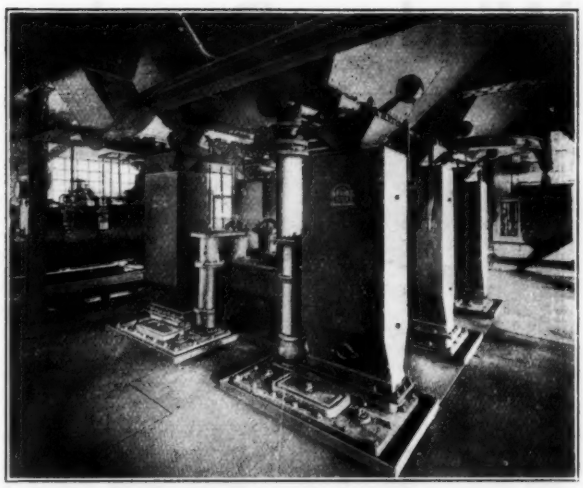
The "Zimmer" Coke Screening Plant.

The boiler is arranged at the charging platform level, provision being made in the carbonizing plant for supplementing the waste gases from the settings at a period when the plant is working at minimum capacity, with fresh gas direct from the producers, thus providing for a supply of steam to meet the Works' requirements under the varying seasonable demands. The boiler is of sufficient capacity to meet all the steam requirements of the Works.

The question of new plant was first brought to the notice of the Committee in March, 1934, and the decision with regard to the installation was not by any means a hasty one; all types of carbonizing plant were considered, and it was eventually decided that continuous vertical retorts would best serve the interests of all concerned. Coke screening plant, with adequate storage hoppers, was included in the scheme, and it was decided that a definite attempt should be made to avoid a building which would spoil the amenities of the district.

Careful consideration of all features, and visits to various plants, enabled the Council unanimously to decide to place the Works in the hands of Messrs. Drakes, Ltd. This decision was confirmed following the public enquiry held by the Ministry of Health, and work was commenced on the site in September, 1934.

The plant was put to work early in August, 1935, and the way in which the work was carried out, coupled with the



Charging Floor Level in Retort House.

results since obtained, has been a source of great satisfaction to the Council, and has proved that the decision made was more than justified.

The inauguration ceremony was performed by County Alderman J. B. Lomas-Walker, J.P. (Chairman of the West Riding County Council), supported by members of the Ilkley Urban District Council. The visitors included a large number of gas engineers and managers from Yorkshire, Lancashire, and other parts of the country.

After an inspection of the retort house, the party were entertained at luncheon at the Craiglands Hydro.

Alderman Lomas-Walker, who presided, in proposing the Toast of " The Gas Industry and the Ilkley Urban District Council," congratulated all concerned in having done something in connection with the Ilkley Gas-Works which, he believed, was a lesson not only to the Gas Industry as a whole but to all local authorities. Not only had they provided a modern plant, but they had done it without spoiling the amenities of the town and the countryside.

Mr. H. E. Bloor (Engineer, Manager, and Secretary of the York Gas Company), in responding, paid a tribute to the manner in which the Ilkley Council had set about modernizing their gas undertaking. The retort house was a beautiful job, both in the artistic sense and in the technical sense. He spoke of the value of gas for floodlighting, and said the new retort house made an ideal subject for permanent floodlighting.

Mr. F. Raymond Hartley (Chairman of the Ilkley Gas Committee), who also responded, said that was a day to which he had looked forward for seven years. One reason for the bad condition of the old works was that they had been starved; for something like £36,000 had been taken from the profits for the relief of the rates. It was the intention of his Committee gradually to improve the auxiliary plant and to bring it all up to the standard of the new carbonizing plant.

Dr. M. R. Dobson (Chairman of the Council), in proposing the Toast of " The Contractors," complimented Messrs. Drakes, Ltd., on the admirable way in which they had carried out their contract. Not only had they kept up to their specification in the matter of materials, but in many instances had exceeded it. The whole of the construction had been finished by the time scheduled. The Council were particularly pleased with the results of the plant, which was producing gas, both in quantity and quality, 10% above the makers' guarantee.

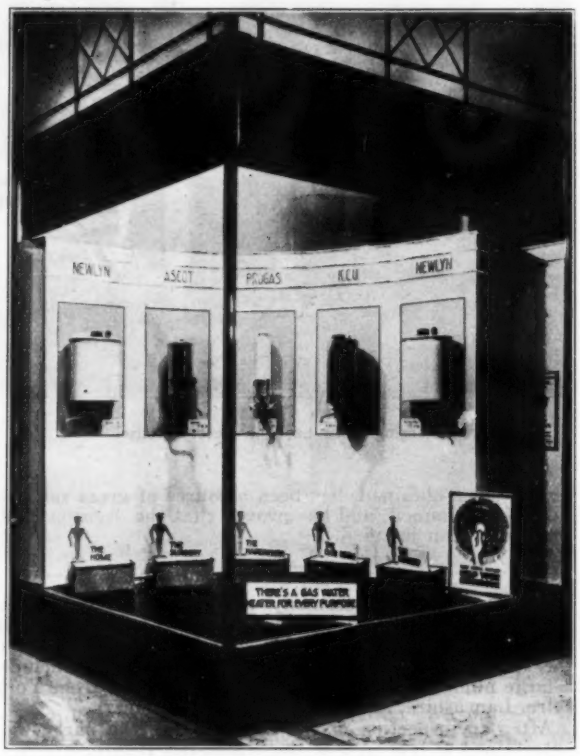
Dr. J. B. Whitfield (Vice-Chairman of the Council), in supporting the toast, said the manner in which Messrs. Drakes, Ltd., had carried out their contract had been unique in his experience of municipal undertakings.

Mr. M. T. Thompson (Managing Director of Messrs. Drakes, Ltd.), in responding, said he had realized from the first that unless the building was carefully designed it would be an eyesore, for an important part of Ilkley overlooked the valley in which the Works were situated. They had already received an order from Newport, Isle of Wight, for a similar job. There was no excuse, he said, for unsightly works to-day, and those who were contemplating new works had a good example to follow in Ilkley. The plant included their last word in carbonization.

Mr. C. F. Pyett, in proposing the toast of the Council's Engineers, remarked on the long services of Mr. W. Everitt, the Gas Engineer and Manager, and his Assistant, Mr. W. A. Dobson. Under their care the gas undertaking had progressed rapidly.

Mr. Everitt, in responding, said that everything in connection with the new plant had been carried out in a most masterly style.

Window Dressing in the Gas Industry



1st Prize—Plymouth and Stonehouse Gas Light and Coke Company.

B.C.G.A. COMPETITION

The *Daily Express* National Window-Dressing Competition attracted, probably, a bigger proportion of entries from the Gas Industry than from any other industry in the country. In section C, that devoted to "Things to Use," in spite of the country-wide competition, gas displays secured the third prize of £50 and four other awards — a most gratifying result in view of the thousands of entries.

3rd Prize—Hythe Showrooms, Folkestone Gas and Coke Company.

The British Commercial Gas Association seized the opportunity of organizing a competition within a competition. Photographs of all entries for the *Daily Express*, after judging, were handed over to a special committee consisting of Sir Frederick Marquis, head of the Lewis chain of stores, Sir Francis Goodenough, C.B.E., and Mr. Richard Harman, Editor of *Display*, and a new list of B.C.G.A. prizewinners selected. The excellence of the Plymouth entry, the third prizewinner in the *Daily Express* competition, was here confirmed by the award of the 1st prize of £25 and of a silver challenge cup which is to be competed for each year.

Not only was the number of entries large—much larger than was anticipated—but the standard was very high and the judges had considerable difficulty in making their selection. The level of excellence attained by the entrants shows that during the past year or two the Gas Industry has realized the supreme importance of its showrooms.

Much of the credit for this new attitude on the part of gas undertakings is due to the B.C.G.A., which has, especially in recent years, not only preached the value of the attractive window, but, by the re-organization and extension of its own studio, set an example to big undertakings and made it possible for smaller ones to obtain material at a much smaller cost than would be possible if designing and completion were done locally. In particular, the recent interchange of displays scheme has provided a constant renewal of windows at a tenth of the cost of purchase outright.

Sir Frederick Marquis, commenting on the competition entries, said: "The Gas Industry is setting an example which others will be well advised to follow. It is dressing its windows to sell goods."

The following are the results of the B.C.G.A. Competition:

1st Prize	Plymouth and Stonehouse	£25 and Cup. Also 3rd prize of £50 in *Daily Express* competition
2nd ,,	Godalming	£15
3rd ,,	Folkestone	£10
10 Prizes of £5	Greenock Corporation Gas Department	
	Ryde, Isle of Wight. Also £5, *Daily Express* competition	
	Gorleston and Southtown Gas Company, Gt. Yarmouth	
	Harrogate. Also £2, *Daily Express* competition	
	City of Nottingham Gas Department	
	York Gas Company	
	Colchester Gas Company	
	Eastbourne Gas Company	
	Royston Gas Company, Herts.	
	Altrincham Gas Company	

In addition to the above awards, the following prizes were given by the *Daily Express*:

Greenock, £5 .. Maidstone, £2

2nd Prize—Godalming Gas and Coke Company.

Gas Utilization in Modern Buildings

by
F. M. H. TAYLOR

Extracts from a Paper presented by F. M. H. Taylor, Ph.D., B.Sc., A.R.C.S., of the Gas Light and Coke Company, at the Gas Industry Session of the Public Works, Roads, and Transport Exhibition at the Royal Agricultural Hall on Nov. 19.

The object of a heating installation is to keep human beings as comfortable as possible and as healthy as possible considering the local circumstances. The "local circumstances" include capital cost, running cost, type, size, and construction of building, distribution of people, and many other factors.

Agreement has been reached by various authorities concerning the effect on human comfort of the main factors under the control of the heating engineer, and agreement has been reached in a qualitative sense concerning the climatic factors affecting the health of human beings. Unfortunately, however, it is not possible to give a cash value to an increase in human efficiency due to an improvement in comfort conditions.

Three main factors control comfort and health from a heating point of view—viz.:

(*a*) Sensations of hotness or coldness.
(*b*) Type of heating.
(*c*) Air freshness, movement and humidity, and variety of climate.

If the first only of these factors is considered, it is equivalent to regarding a human being as a slow combustion stove about 5 ft. 9 in. in height, approximately cylindrical in shape and with a surface area of about 20 sq.ft., the temperature of which is maintained at about 75° F., partly by clothes and partly by external heat. The human being is, in fact, possessed of much more delicate feeling, and mere sensation of warmth is insufficient for adequate comfort.

Hotness and Coldness.—The provision of warmth is the first objective of any heating system. The sensation of warmth is dependent on the heat losses from the human body. If the body is losing heat in a normal manner at a certain rate comfort is experienced; if the heat loss should be greater than this, one is "too cold;" if less than this, one is "too hot."

The blood is under perfect thermostatic control at 98·4° F. and as a result the average temperature of the clothing and exposed parts of a human body under comfortable conditions is about 75° F.

A comfortable sedentary worker loses heat at the rate of about 400 B.Th.U. per hour, and this heat loss is made up chiefly from the following sources:

(*a*) *Heat Loss by Radiation.*[1]—Heat is transferred by radiation directly from the body to any surrounding surface at a temperature lower than 75° F. Alternatively, surfaces at temperatures above 75° F. will supply heat to the body by radiation. The final effect of radiant heat will depend on the temperature and extent of these surfaces and their disposition with respect to the surface of the body.
(*b*) *Heat Loss by Convection.*—Heat will be transferred from the body to surrounding air at a temperature below 75° F. The effect of convection will depend upon the temperature and velocity of the air.
(*c*) *Heat Loss by Evaporation.*—Heat will be lost by evaporation from the skin, damp clothing, and the lungs. The loss will increase with increasing air temperature and decreasing humidity.

Under comfortable conditions, about 75% of the total heat loss from the body should be by convection (30%) and radiation (45%) and 20% by evaporation.

If conditions are such that the heat loss by convection and radiation is too small—*e.g.*, high air temperature and surroundings at a high temperature—the total heat loss must be increased by evaporation and sweating takes place.

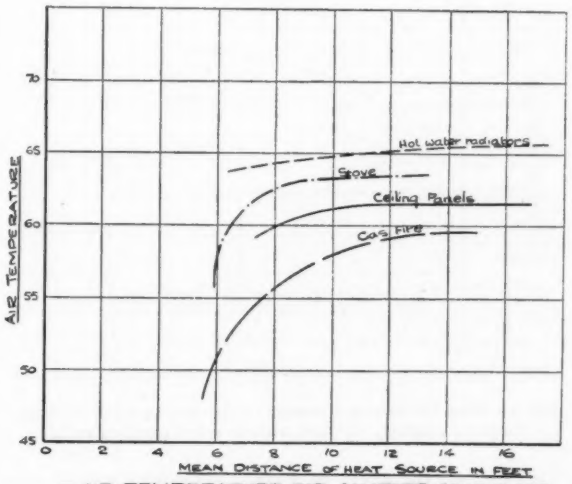
If conditions are such that the heat losses by convection and radiation are too large—*e.g.*, low air temperature and surroundings at low temperature, changes take place in the skin which minimize the natural moisture production and increase the apparent thermal resistance of the skin. There is also a tendency to decrease the available surface area of the body. These changes are associated with shivering and sometimes huddling.

These methods may be necessary to keep the blood at its correct temperature, but the human being himself suffers from a feeling of discomfort. It therefore follows that as far as feeling and warmth are concerned, it is most important to control the heat loss by convection and radiation and to a more limited extent the heat loss by evaporation.

Type of Heating.—The exact conditions for comfort will depend on the individual concerned, but the average results of a large number of tests on different people show that comfort is given under the following conditions for sedentary workers:

(1) Air temperature 65° F. and surrounding surfaces at 65° F.
(2) Air temperature above 65° F. and surrounding surfaces below 65° F. The ratio of heat lost by radiation to that lost by convection is now greater than for (1). The degree of comfort given is less than that given by (1).
(3) Air temperature below 65° F. and surrounding surfaces above 65° F. The ratio of heat lost by radiation to that lost by convection is now less than for (1).

If some of the surrounding surfaces are at a very high temperature, the body may then gain radiant heat and comfort can be established at an air temperature as low as 45° F. even when the radiant heating is from one direction only. The degree of comfort given is greater than that given by (1). Fig. 1 gives the air temperature for comfort conditions for various sources of heat.



— AIR TEMPERATURE FOR COMFORT CONDITIONS, FOR VARIOUS SOURCES OF HEAT

Gas fire rate . . . 30 cu.ft. per hour

Fig. 1.

Among the most perfect conditions known, is the cold atmosphere of a winter sports resort, the temperature frequently being below zero, while, at the same time, brilliant sunshine—a source of radiant heat—keeps human beings in a condition of complete comfort.

Air Freshness, Movement and Humidity, and Variety of Comfort.—Freshness of the air cannot be defined accurately, nor are all the factors known which make air under indoor conditions most pleasant. Dust, bacteria, odours, moisture, ionization, and temperature all play a

[1] Fishenden and Willguess, "The Heating of Rooms," Fuel Research Board, 1925, Tech. Paper No. 12.

part and can be controlled. It has not, however, been possible by an air conditioning installation to recirculate the air of a building and obtain entirely satisfactory conditions of freshness unless a proportion of fresh air is supplied to the building.

There are three factors of particular importance in maintaining freshness:

(*a*) Positive ventilation must be provided so that the air in a room is changed regularly. This fresh air is necessary for hygienic reasons when a number of people are gathered together, and also to prevent a sensation of staleness.

(*b*) There must be no overheating in the room. Rooms are notoriously stuffy when overheated, especially if too high an air temperature is associated with too high a relative humidity of the air. The lower the air temperature at which comfort can be established, the greater is the feeling of freshness.

(*c*) A definite movement of the air helps to produce a feeling of freshness and eliminates the danger of air stagnation. Heating systems with good ventilation can produce sufficient air movement. Under conditions of too high an air temperature for comfort, a fan is employed to alleviate the feeling of discomfort by increasing heat losses from the body.

Ventilation.—Some ventilation may be provided either by natural leakage through cracks in the floors or the windows, but in practice this is found to be insufficient for really comfortable conditions. The use of a flue together with a solid fuel or gas fire gives really positive ventilation. Mechanical ventilation is used to ensure an air change in a room of three up to twelve or even twenty changes per hour.

Humidity.—One of the disadvantages of a heated atmosphere without sufficient air change is a feeling of dryness which has been associated with central heating. This can be alleviated by the use of the flueless gas appliance, which adds sufficient moisture to the room to counteract the discomfort of an intensely dry atmosphere.

Convenience Factors and Economic Considerations.—Unless central heating is employed of such a type that the temperature of a room, which is to be used for short periods, is always maintained at 65°, any form of heating which is to be shut on or off according to whether the room is occupied, must for reasonable convenience be rapid in its effect.

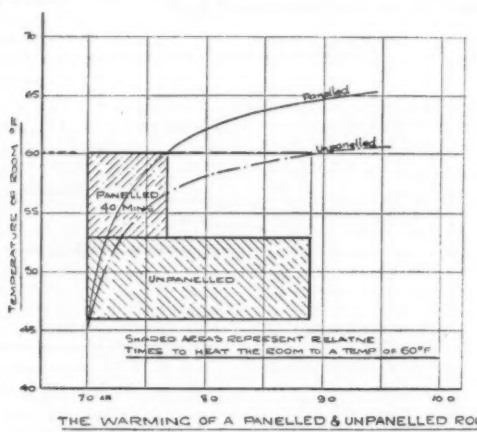


Fig. 2.—Time for heating a room by a Gas Fire to a condition of adequate comfort, with and without wood panelled walls.

Fig. 2 shows the effect on a room designed for local heating, in this case a dining room, of panelling designed to enable the heating up by a gas fire to take place quickly. Wood panelling has a low specific heat and therefore very quickly attains a temperature consistent with comfort conditions. Heavy brick walls with a high capacity, in this case, previously took three or four times as long to become sufficiently warmed, while gas had to be turned on so early before use that not only was convenience sacrificed, but the cost was as much as a central heating plant maintaining the room constantly at 65°. Fig. 2 is also an illustration of the importance of architectural design from the point of view of heat conductivity and the heat capacity of the structure.

The economics of heating as affecting the choice of heating equipment depend on:

(*a*) The occupation factor and the number and distribution of people to be heated.

(*b*) The load factor—*i.e.*, the portion of time which the outside climatic conditions necessitate full heating as distinct from the partial heating necessitated by milder climatic conditions.

(*c*) Whether central or local heating is employed, or a combination.

(*d*) For central heating—pipe losses, losses through lack of perfect control of the installation.

(*e*) Structural or cost considerations preventing the installation of a complete central heating system.

TABLE 1.—*A Typical Range of Gas Rates of Convector Gas Heaters.**

[To give Air Temperature for Comfort in the Coldest Weather.—The Effect of Occupation Factor on Gas Consumption.]

Room Capacity.	Glass Area. Sq.Ft.	Gas Rate per Heating Period—Cu.Ft./Hr.		
		1 Hr.	2 Hr.	8 Hr.
300	7	9	6·5	4·5
400	10	11	7·5	5·5
500	12	13	9	6·5
700	20	17	12	8·5
900	25	19	13	9·5
1,000	30	21	15	10·5
1 250	30	24	17	12
1 500	45	28	19·5	14
1,750	45	31	22	15·5
2,000	60	34	24	17
2,500	75	40	28	20
3,000	90	46	32	23
4 000	120	56	39	28

* To obtain the gas rates for other types of heaters the multiplying factors are as follow:—

Convector heater	1·2
Gas fire	1·7
Flueless gas fire	0·9

Table 1 shows the effect of the occupation factor on the gas consumption. The gas consumption for occupancy of various periods from one to eight hours are compared, and it will be seen that it is very much greater during the warming-up period for the first hour, but thereafter assumes a nearly constant value.

The gas consumption for alternative types of heater—*i.e.*, gas fire, flueless gas fire, and convector heater—may be obtained by using the factors given.

TABLE 2.—*Cost of Heating by Various Methods.*

Time Heat is Needed.	Coal.	Coke.	Gas Fire.	Central Heating.	Convector Gas Fire.
	d.	d.	d.	d.	d.
1 hour	2 2	2·3	1·3	5·5	0·8
2 hours	2·7	3·1	2·6	5·5	1·6
3 ,,	3·2	3·1	3·9	5·5	2·4
4 ,,	3·7	3·8	5·2	5·5	3·2
6 ,,	4·7	4·5	7·8	5·5	4·8
8 ,,	5·7	5·2	10·4	5·5	6·4
10 ,,	6·7	6·0	13·0	5·5	8·0

Table 2 shows how this may affect the choice of method of warming a room between (*a*) gas fire, (*b*) solid fuel fire, and (*c*) central heating. For low occupancy factors gas heating is cheaper, because it has a low time of heating up and can be shut off immediately after use. The solid fuel fire requires a long time of heating up and a certain wastage after use, and at the other extreme, central heating has to be on all day even though required only for one hour. For a whole day's heating central heating is the least expensive, although a high period of occupation, six to eight hours, may be obtained by gas heating before the running cost is appreciably higher, and it is to be borne in mind that the gas installation cost in the first instance is low.

The Cost of Installation of Central Heating as Compared with Local Gas Heaters.—A typical office block, of five floors of 3,020 cu.ft. capacity and 31,000 sq.ft. floor space, which is to be heated by gas convector fires supplemented by gas radiators and panel heaters provides a useful basis for comparison.

—	Gas Local Heaters.	Central Heating. Coke Fired.
Installation costs	£2,410	£3,250
Running costs	£375 per annum	£300 per annum

The gas installation has individual room control and gives a higher degree of comfort to the occupants, and the whole installation can be put in without any interruption of the regular use of the building. The central heating installation would include boiler, connection to flue, all pipe work and radiators, but would entail a considerable amount of inconvenience to the occupants while the installation was being made. The difference in capital cost would be increased if the local thermostatic controls fitted to the gas installation were eliminated.

Central Heating Supplemented by Local Heating.—This method, as distinct from complete central heating, has the following advantages:

(*a*) Extra comfort conditions may be obtained from the radiant heat of a gas fire or solid fuel fire.

(*b*) The variety effect in heating may also be obtained by the directional effect of heat from the fire or gas local heater, also an increasing economy for a limited number of people.

(*c*) Ventilation, accepted as of considerable importance in a building, is made positive by the use of a solid fuel or gas fire with a flue.

(*d*) Even where flues are not fitted, humidification of

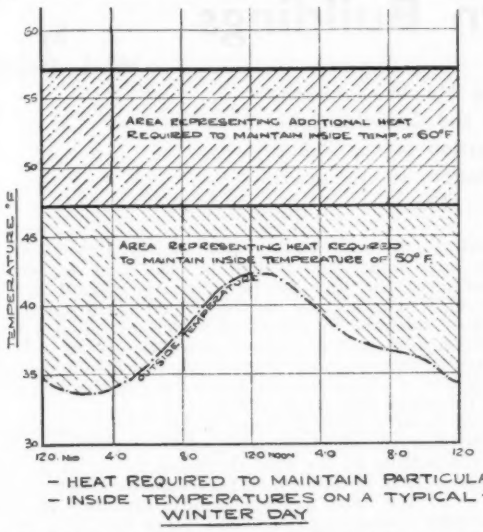


Fig. 3.—Showing the reduced Load Factor for Heating to 50° F. as compared with Full Heating to 60° F. for a typical winter's day.

the atmosphere may be effected by the flueless gas appliance, as this ensures that sufficient moisture is delivered to the room to counteract the dry effect of a centrally heated room, also radiant heaters have a lower air temperature for comfort and therefore a higher *relative* humidity.

(*e*) The use of local heaters allows of a more than proportionate reduction in the capacity of the central heating plant, with a corresponding economy in installation costs, and considerable economy in operation may be effected if the occupancy factor is small. The saving in fuel in a central heating plant by cutting down by 5° or 10° the temperature maintained is shown in Fig. 3, from which it can be seen that a small reduction in the temperature maintained gives a disproportionately high economy in fuel consumption.

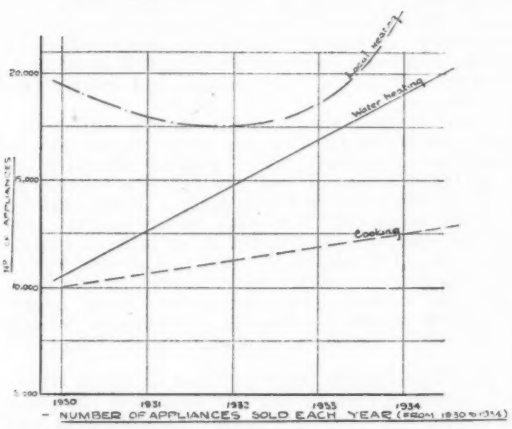


Fig. 4.—Number of Gas Appliances sold each year for new buildings.

(*f*) Heating of isolated rooms, even in a building centrally heated, may best be done by local heaters to avoid losses from the pipes in carrying a hot water system to and from these rooms.

(*g*) A fire, whether solid fuel or gas, has a decorative effect to a room and does provide an architectural and a comfort centre lacking in one entirely centrally heated.

For the great majority of buildings there is a very little doubt that one or other combination of central heating and local heaters is the ideal system for satisfactory heating, consistent with economy and maximum comfort conditions.

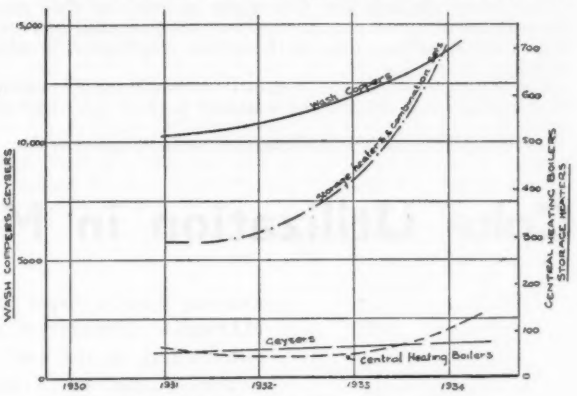


Fig. 5.—The Sale of Water Heaters for new buildings.

Local Heating.—In the following circumstances local heating only is required:

(*a*) For temporary buildings, where the capital cost of a complete central heating plant would never be justified, and where the quickness of installing a gas service and radiators and fires proves an added advantage.

(*b*) Where the use of a room is very occasional, as is frequently the case with some halls and club rooms.

(*c*) Where capital cost is a primary consideration.

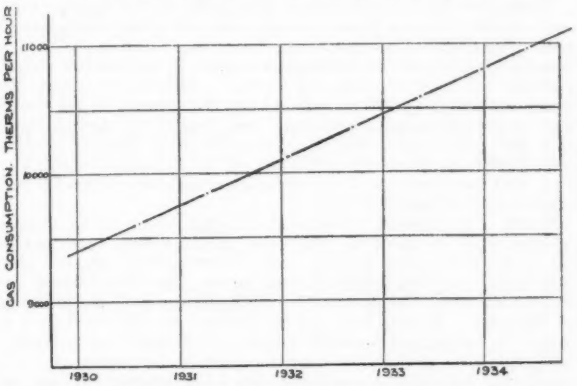


Fig. 6.—The Gas Consumption of New Apparatus for new buildings.

(*d*) For open-air heating, such as for football and race meeting stands and bathing pools, where radiant heat only can be used.

(*e*) For modernizing existing buildings where the installation of central heating would necessitate considerable cutting away of existing building.

TABLE 3.—*The Number of People that can sit in Comfort around Radiant Heaters at Different Air Temperatures.*

Air Temperature.	45° F. No. of People.	50° F.* No. of People.	55° F.† No. of People.	60° F. No. of People.
Gas fire—				
5 radiant	..	2	5	At least 10
6 ,,	1	2–3	6	,,
7 ,,	2	3–4	7	,,
9 ,,	2–3	4	8	,,
10 ,,	3	4–5	9	,,
12 ,,	4	5–6	10	,,
15 ,,	4–5	7	At least 10	,,
Convector gas fires—				
11 cu.ft./hr.	..	..	..	5–6
22 ,,	..	..	2	9
33 ,,	..	2	4	At least 10
Paravex flueless	..	1–2	3–4	9–10
Portcullis—				
1 unit screen	..	1	2–3	8
2 ,,	1	2	5	At least 10
Bowl fire	..	1	1	2

* Most suitable air temperature for gas fire.
† Most suitable air temperature for convector or flueless fire.

Figs. 4, 5, and 6 show how the sales of gas apparatus have for new buildings in the Gas Light and Coke Company's area increased during the last few years, and it is to be recorded that the first eight months of this year show an even bigger rate of increase; the potential increase in gas consumption, due to these new appliances, is also shown.

The introduction of the domestic two-part tariff system of charging consolidates the existing uses of gas, and at the same time develops increased consumption of gas which can be supplied without any appreciable capital cost for mains and plant, and therefore at lower rates than hitherto charged. Unlike electricity, the gas charge can be reduced substantially with increasing use and the new terms put forward, after allowing for the standing charge, correspond to the supply of electricity at between ½d. and ½d. per unit. This will be available even for some of the smallest of domestic consumers.

(A report of the joint discussion on the Papers of Dr. Taylor and Mr. Boon will be published in next week's issue.)

Coke Utilization in Modern Buildings

by
W. L. BOON

Extracts from a Paper presented by Mr. W. L. Boon, M.I.Mech.E. (Manager of the London and Counties Coke Association), at the Gas Industry Session of the Public Works, Roads, and Transport Exhibition at the Royal Agricultural Hall on Nov. 19.

Coke probably lends itself to use in automatic equipment better than any other solid fuel. In the first place it is safer because of its freedom from volatile constituent, and, further, it is sized to the appliance in which it is to be used. It is cleaner in operation than coal, as well as more efficient under actual combustion conditions, and the degree of automaticity to which it can now be applied is equal to that of oil-fired systems, excepting only that it cannot be immediately extinguished and relit.

In aggregate the cost of operation of central heating systems is for coke about one-half that of oil fuel, while the actual attendance necessary would not be any greater than would be the case with a liquid fuel plant.

These are factors which are not sufficiently appreciated, and architects and those responsible for plant installation and operation are all too prone to compare ancient coke systems with alternative modern methods to the unfair disadvantage of modern coke systems. Efficiency alone has been increased by 25%, and where the plant in old buildings was well maintained and was considered satisfactory at a 50% efficiency, the modern automatic central heating coke boiler produces an efficiency of 75% round the clock at high and low loads, a figure which cannot be beaten by any other solid or liquid fuel.

There is no system of central heating which can compare in cost with a modern coke-fired plant when aggregating the costs over long periods. It is frequently argued that coke prices are higher than coal prices, but the former are stable, whereas the latter are fluctuating, with a tendency to increase. Stocks have to be carried by the coal user in order to safeguard himself against continuity of supplies, so that while purchases may frequently be made at lower rates, the aggregate costs are the final answer. Coke, on the other hand, requires no safeguarding and no expensive stocks need be carried.

Overheating by badly disposed and badly controlled installations has caused and still causes a strong prejudice against central heating in England. Heating apparatus is usually designed to maintain temperatures at 65° F., when the external temperature is 32° F., but the average temperature throughout the seven winter months in the South of England is 43° F., so that the average output of the heating apparatus should be $\frac{65 - 43}{65 - 32} = \frac{22}{33} = 67\%$. In addition to variations of load arising from external variations in temperature, other fluctuations are caused by sun, wind, and casual heat in the rooms arising from lights and occupants. If money is available it is undoubtedly most satisfactory to provide individual temperature control in each room, in addition to controls on the boiler. Unfortunately, individual room control is expensive, costing about £5 per room, and except in special circumstances reliance has to be placed upon a centralized control apparatus and partly on the skill of the stoker.

Automatic Control.—The control of hand-fired or gravity feed coke boilers, operating with natural draught, is effected simply by controlling the settings of the dampers according to the operation of a thermostat placed either in the flow pipe from the boiler, or in a typical room. In the case of steam boilers a pressurestat fulfils the same function. The settings of the dampers are moved through a link gear actuated by an electric motor, a heat motor, or apparatus of the " Thrustor " type.

It is usually accepted that in a heating installation automatic control of the boiler will, in England, effect economies in fuel not less than 15%, and the installation cost of the requisite apparatus is soon repaid. A schedule can be drawn up, after a few weeks' running, giving the flow temperatures of the heating system required for particular weather conditions, and it will be necessary to see that adjustment of the flow temperature thermostat is made accordingly. The setting can be varied approximately to meet the conditions by means of a control called a Variostat, which adjusts the setting automatically according to the outside temperature. A time switch is sometimes installed to lower automatically the setting of the thermostat during the night and week-ends.

Control from a typical room is sometimes better than from the flow temperature, and removes the necessity to adjust the setting of the flow thermostat. In large buildings, however, it is difficult to find a room which is representative of the true average conditions, and the more tedious flow temperature method gives better and more economical heating.

Hand Control.—Where automatic control is not provided, adjustment for varying conditions is made by altering the boiler temperature and by manipulation of the valves on the radiators or warming panels. Usually the valves are in practice turned full open during a cold spell, and thereafter remain on during the whole of the winter. If the outside temperature rises, making the internal temperature too high, windows are opened to dissipate the surplus heat, and a great deal of waste accordingly ensues, particularly as the majority of stokers pay more attention to the temperature on the return pipe of the heating apparatus, than to the flow. This is probably because they learn by experience that if they maintain a given return temperature they are not likely to receive complaints of under-heating. In fact, the majority of stokers fire their boilers in such a manner as to reduce complaints to the minimum.

In the majority of installations, particularly in large buildings, one or two circuits of the heating systems are sluggish in comparison with the remainder, and a higher general temperature must be maintained throughout the system so that the rooms on these circuits may be properly warmed. This point is worth investigation in any system of magnitude, as not infrequently a simple alteration of pipework or of main controlling valves will result in a substantial decrease in fuel consumption and greater satisfaction in service.

The heat losses from buildings by open windows, particularly on a windy day, are very considerable, and, although adequate ventilation is hygienically essential, the state of the windows in cold weather is a reliable indication of the efficiency of the stoking. Some experienced stokers will judge conditions very closely by observing the number of open windows visible in an internal court. All windows should be closed at night and during week-ends, as this simple precaution conserves considerable heat and obviates the necessity for forcing the boilers before the building is re-occupied. Forcing is invariably wasteful of fuel and results in increased maintenance charges on the boiler.

In most installations, such as those in offices, where full heat is required only during the day, it is customary to bank the boilers during the night. A method of working to maintain satisfactory temperatures during working hours with the minimum of fuel consumption can be drawn up from a series of temperature observations.

In one of the largest office buildings in London, heated by radiators, where a normal temperature of 62° F. is required between the hours of 9.30 a.m. and 6 p.m., banking can commence in mild weather shortly after midday; the heat content of the building is sufficient to maintain adequate temperatures until early evening. Early next day the boilers are brought into full firing at times depend-

ing upon the external and the building temperatures. For example, if the outside temperature is between 30° and 35° F., it is necessary to get the boilers away at 11 p.m. on Sunday night, in order that the whole building may be adequately warmed by 9.30 a.m. the following morning. If the temperature is between 35° and 40° F., however, it suffices to commence working at 2 a.m., between 40° and 45° F. at 3 a.m., between 45° and 50° F. at 4.30 a.m., and above 50° F. at 6 a.m. For the remainder of the week the hours of firing become progressively later, owing to the heat content of the building, and the following time-table is found to be satisfactory.

TABLE 1.*—*Operation Schedule for Central Heating System Operated by Hand-fired Boilers.*

Outside Temperature.	Monday.	Tuesday and Wednesday.	Thursday, Friday, and Saturday.	Return Temperature at 7 a.m.
30-35° F. . .	11 p.m. Sunday	2. 0 a.m.	3. 0 a.m.	125°
35-40 ,, . .	2. 0 a.m.	4. 0 ,,	5. 0 ,,	120°
40-45 ,, . .	3. 0 ,,	4.30 ,,	5 0 ,,	110°
45-50 ,, . .	4 30 ,,	5 30 ,,	6. 0 ,,	90°
50-55 ,, . .	6. 0 ,,	6.30 ,,	7. 0 ,,	..

* Extracted from Proc. Inst. Heat. and Vent. Engrs., February, 1932 L. J. Fowler, "The Control of Heating Systems."

The production of a programme of this nature, combined with intelligent control of stoking, will save much fuel; it is, however, undertaken too seldom.

"All-in" Heating Contracts.

Gas undertakings have, during the last few years, had to compete with claims of lower running costs, made by suppliers of competitive fuels or manufacturers of apparatus, and which it was believed could not be substantiated in practice. These claims were counteracted by introducing the "All-in" contract, under which the gas concern undertakes, at a fixed annual sum, to supply all the fuel necessary for the maintenance of the desired temperature in the building and for the provision of reasonably adequate hot water supplies, and to service the boilers, deliver the fuel, and remove ashes from the site. The offer of such a contract is a definite guarantee, and enables the owners of buildings to assess accurately the heating costs; it relieves them of all responsibility for the operation of the heating. In the case of buildings containing lettable spaces, the contract is usually quoted in the form of a fixed basic charge *plus* an additional charge for each rentable space occupied.

In normal circumstances this type of contract is limited to those buildings in which gravity feed type boilers are installed, since by this means the periods at which attention is needed are reduced, with consequent saving in labour cost. Furthermore, the high efficiency obtained from gravity feed boilers enables the "All-in" cost to be kept at a low figure. In special circumstances, similar contracts can be obtained for other types of boilers, even if hand-fired.

By running a number of these contracts simultaneously, the gas concern is able to provide highly skilled labour at reasonable cost, and it is the building owner who thus benefits by the expert running of his heating and hot water service apparatus. Before entering into a contract it is usual to stipulate that the boilers shall be under automatic thermostatic control for which the installation of the necessary apparatus is not costly.

Heat Loss from Buildings.

To calculate the size of heating apparatus required in a room, the heating engineer computes the areas of the different types of surfaces, such as walls, windows, floor, or roof, through which heat can pass, and by means of heat transmission coefficients estimates the flow of heat through these surfaces when the internal temperature is maintained at the required degree and the external temperature is 30° or 32° F. as may be decided upon. Heat transmission coefficients are usually expressed as the number of B.Th.U. conducted in one hour through an area of one square foot of the wall or window, &c., when a temperature difference of 1° is maintained between the inside and outside. Typical coefficients are given in Table 2.

Transmission through Walls.—It will be noted that although, in general, concrete walls transmit considerably more heat than brick walls, the transmission coefficients only differ slightly when the walls are plastered internally.

Transmission through Roofs.—The type of roof construction usually employed for large public buildings is such that the heat loss can be calculated with comparative accuracy. Where, however, tiled roofs or corrugated asbestos roofs are used the losses are likely to be greatly increased by air leaks set up by slight movement and shrinkage.

Transmission through Windows.—The transmission coefficient through windows of standard thickness is 1·07, which is nearly four times as much as that through a 14 in. brick wall plastered on the inside. The important relationship between the area of windows and the heating requirements of a room thus becomes apparent. The internal and external surfaces of a window are at approximately the same temperature, which is near to the mean of the internal and outside temperatures. A room maintained at 65° F., with an outside temperature of 45° F., will thus have a window surface temperature of 55° F., which will cause cooling of the air and set up down draughts unless prevented by the fixing of radiators or other heating surface beneath the windows.

TABLE 2.—*Typical Heat Loss Coefficients.*

——	Thickness.	Transmission Coefficient.
Brick wall—plain	4½ in.	0·50
	9 ,,	0·35
	18 ,,	0·23
	27 ,,	0·18
Brick wall—plaster one side	4½ in.	0·45
	9 ,,	0·33
	18 ,,	0·22
	27 ,,	0·17
Concrete wall—plain	4 in.	0·70
	8 ,,	0·51
	12 ,,	0·41
	16 ,,	0·34
Concrete wall plaster one side . . .	4 in.	0·62
	8 ,,	0·46
	12 ,,	0·38
	16 ,,	0·32
Concrete floor—on earth	6 in.	0·49
Concrete floor with 1½ in. wood blocks .	6 in. (concrete)	0·25
Concrete roof, asphalted and plastered.	9 in. (concrete)	0·25
Tiled roof not boarded, lath and plaster ceiling under	..	0·35
Do., with boards under tiles	..	0·25
Glass—single window	..	1·07

Effect of Wind on Heat Transmission.—The effect on heat transmission of wind at 15 miles an hour is shown by Table 3.

TABLE 3.*—*Effect of Wind (15 Miles per Hour) on Heat Transmission Coefficients.*

Material.	Thickness in Inches.	Heat Transmission Coefficient.		Increase of Coefficient as the Result of Wind.
		Still Air.	Moving Air.	
				%
Glass (single layer) . .	0·085	0·73	1·075	47
,, (double layer) . .	0·17	0·369	0·434	18
Brick	4	0·448	0·572	28
,, ...	24	0·161	0·174	8
Concrete	4	0·490	0·655	34
,, ...	24	0·220	0·248	13

* Extracted from "Mechanical Equipment of Buildings," Harding & Willard, p. 233, Vol. 1, Second Edition, New York, 1929.

It is a normal practice with heating engineers to allow a margin of 15% extra heating surface in those rooms which are exposed to cold winds. Wind effect not only causes an increase in the transmission coefficients, but sets up infiltration through cracks around windows and doors, and through the building materials themselves, and increases the air change of the room.

The Effect of Sunshine.—Solar radiation has considerable effect upon the heat loss from a room. Outside the earth's atmosphere, the solar radiation at a plane perpendicular with the rays is 429 B.Th.U. per hour per square foot of surface. The following table shows average figures for the effect of winter sunshine in England.

TABLE 4.*

Winter Sunshine.	B.Th.U. per Sq.Ft. per Hour.
Sun effect on glass (skylight)	130
,, ,, ,, (vertical)	30
,, ,, 13 in. brick wall	5
,, ,, slates or boards	8

* Extracted from Trans. Heat and Vent Engr., 1931, 4, p. 317, A. T. Henly.

Casual Heat.—In public buildings the heating requirements will be affected by the casual heat obtained from occupants and from lights.

Advantage of Insulating Buildings.

The economy and comfort obtained from insulating buildings has not yet received general appreciation. Not only is the heat loss reduced in winter, but the buildings are kept cooler in summer and the health and efficiency of the occupants improved. It is a comparatively difficult and expensive matter to insulate walls, but in public buildings there is little difficulty in providing satisfactory insulation to the roof. Two inches of slab cork laid on top of concrete and covered with asphalt makes the top storey considerably more comfortable, and a simple calculation of the reduction in transmission of heat through the roof shows that in saving of fuel only the insulation pays for itself in about five years. Where tiled roofs are used with joist ceilings to the rooms in the top floors, the cork can be fixed in slabs 1 ft. wide between the joists which are arranged at centres suitable for accommodating the cork slabs without cutting.

Position of Radiators.—It is always desirable to fix radiators beneath windows or in those positions where the greatest heat losses occur. When this is done, warm air rises from the radiator, mixes with the air cooled by contact with the window or exposed surface, and prevents down draught. If a radiator is fixed on the wall opposite to the window, the warm air rises from the radiator and passes along the ceiling; air cooled by the window drops to the floor; and thus a ready circulation of air is set up which may cause discomfort to the feet of those sitting near the windows.

Care must be given to the fixing of radiators, especially those emitting the major portion of their heat as convection, in order that air may stream over them without undue obstruction. Recessing, encasing, and the provision of shields all reduce the emission. It may be desirable to recess radiators on occasion, but encasing and shielding should be avoided, for besides necessitating larger radiators the fittings collect dirt and render cleaning difficult. A decision regarding recessing and encasing should always be made before a heating contract is placed. Trouble frequently occurs by a late decision on this matter, by which time connecting pipes are installed, and it is impossible to increase the size of the radiators without great expense.

Temperature Gradients.—The gradual disappearance of the column type radiator and its replacement by comparatively long radiators giving a large proportion of radiation has resulted in the material reduction in the temperature gradient from floor to ceiling. With the narrow and tall column type radiators a rapid stream of heated air passes up to and collects on the ceiling, which in rooms 10 ft. high may easily be 10° higher than the temperature of the floor. This not only means that the heat transmission through the ceiling is unnecessarily increased, but the hot air being comparatively mobile readily escapes through cracks round the windows and by infiltration through cracks in the ceiling, or through the plaster itself.

Air rises from the comparatively long, thin, narrow radiators at a much lower temperature and therefore at a lower velocity than it left the tall column radiator. As a result, more intermixing takes place, and the temperature gradient from the floor to the ceiling is reduced. The installation of ample heating surface is another step which can be taken to reduce the temperature gradient, since the system can be run at a lower temperature and the velocity of the convection currents again cut down.

A Window Display with Movement

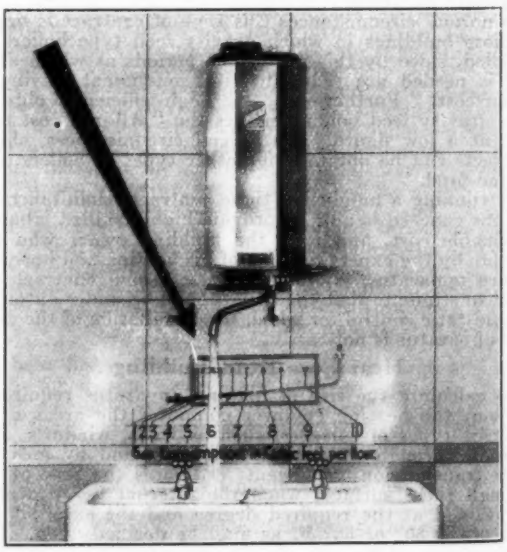
Gas undertakings will be interested to learn that a working model window display has been developed for demonstrating the operation of the " K.C.U." (sink type) Water Heater. The whole arrangement is mounted on a large display board and requires connection to the gas supply, and a small water supply from the town main or overhead tank.

The arrangement automatically discharges hot water at regular intervals into a washing bowl or other suitable receptacle, and by means of a slope pressure gauge shows the rapid response of the thermostat. With each discharge of hot water an immediate increase in the gas rate is shown, and in the intervals between these withdrawals the rapid recovery is indicated by the reverse operation of the thermostat in reducing the gas rate. The slope gauge gives a visible indication of the actual gas rate, which is marked on a graduated scale subdivided in cubic feet per hour. The display is entirely automatic and will operate without attention after primarily adjusting the gas and water rates.

While this display demonstrates only the automatic and precise operation of the thermostat, there are many other important features of this heater which have been developed as a result of a wide experience and careful study of water heater design. The importance of efficient and long reliable service with a minimum of maintenance are the least that can be expected of the latest water appliances. The makers, Messrs. John Wright & Co., Ltd. (Radiation Ltd.), claim that the point of greatest importance is the special design of the combustion chamber, which by its method of construction and the materials used, is not subjected to the devastating effect of condensed water from the combustion products. Before developing this construction many materials were tested, but were all discarded as unsatisfactory, either because of holing due to corrosion or choking of the combustion space by corrosion products. The prevention of continuous condensate is the only reliable method of preventing rapid corrosion, and this has been accomplished in the " K.C.U." by so constructing the combustion chamber that the surface attains a temperature above the dewpoint of the products. The surface in contact with the combustion products is separated from the surface in contact with the water by an annular space filled with particles of special material, which by reason of their size, thermal conductivity, and specific heat, enable the surface quickly to attain the temperature necessary to the prevention of condensate.

In addition to the steps taken to avoid condensate, the combustion chamber is made from a material, carefully selected after extensive experiment, that is specially resistant to attack by the hot gases, both chemically and as regards changes in temperature. Cleaning and maintenance of the combustion chamber is thereby reduced to a minimum, and experiment indicates, it is claimed, that the wearing life exceeds that of copper, the alloys of copper, and various aluminium alloys, by at least five times. This, coupled with the non-condensing feature of the heater, indicates a wearing life so long that extended tests have not succeeded in determining the limit of its durability.

Contrary to what might be expected of a non-condensing heater, a high thermal efficiency is attained, 78% to 80% of the gross energy being utilized. Thermal efficiency, however, should not be judged entirely by the amount of

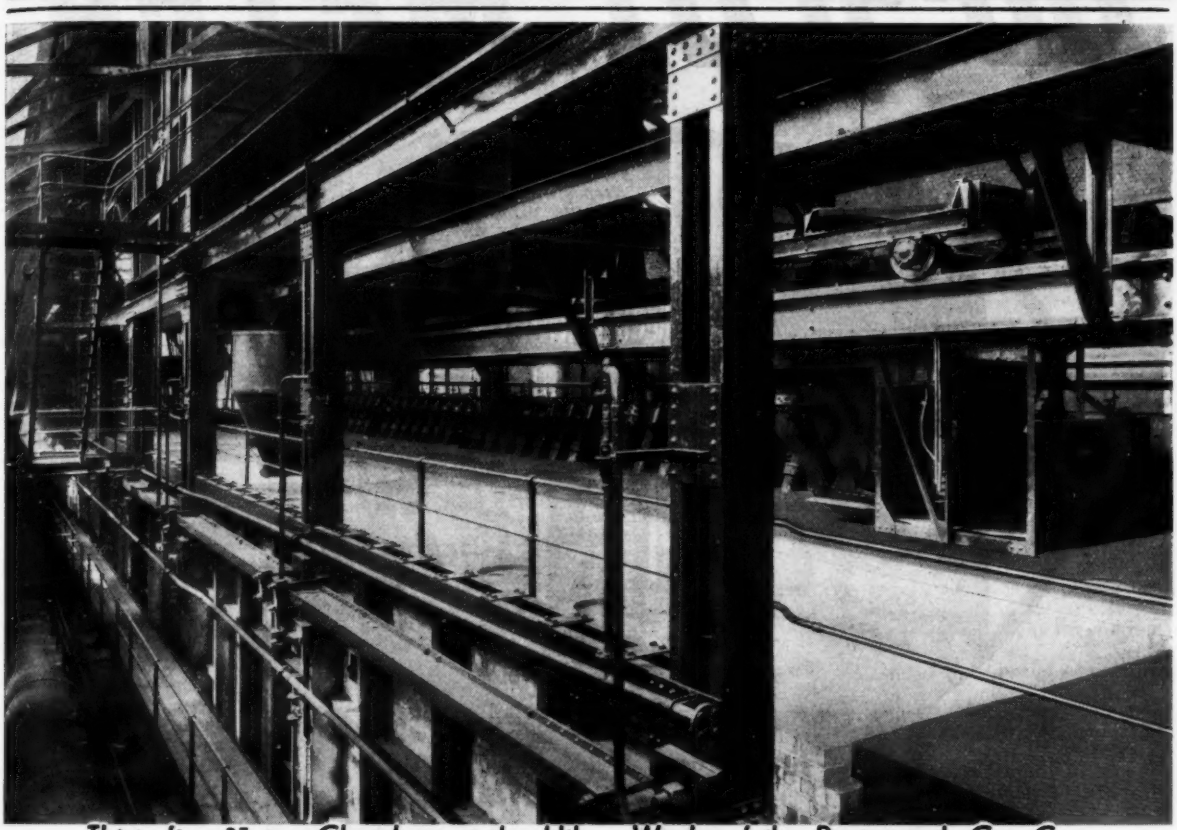


gas burned for the production of a given amount of hot water, because, where an appliance is to remain working for lengthy periods, the amount of gas required to maintain the water temperature is equally important. This factor is also specially provided for in the arrangement of the baffle which, although removable, maintains good thermal contact with the combustion chamber and ensures a high efficiency of heat transfer when the appliance is operating at a low gas consumption.

Another factor of importance is the influence of thermostatic control on hot-water output, and this has been cared for in the special design of thermostat fitted to " K.C.U." Heaters. Its operation is such that the gas consumption is not materially affected until the water has attained the desired temperature, ensuring the fullest hot-water output.

W-D Intermittent Verticals

16 Successful Installations in Great Britain



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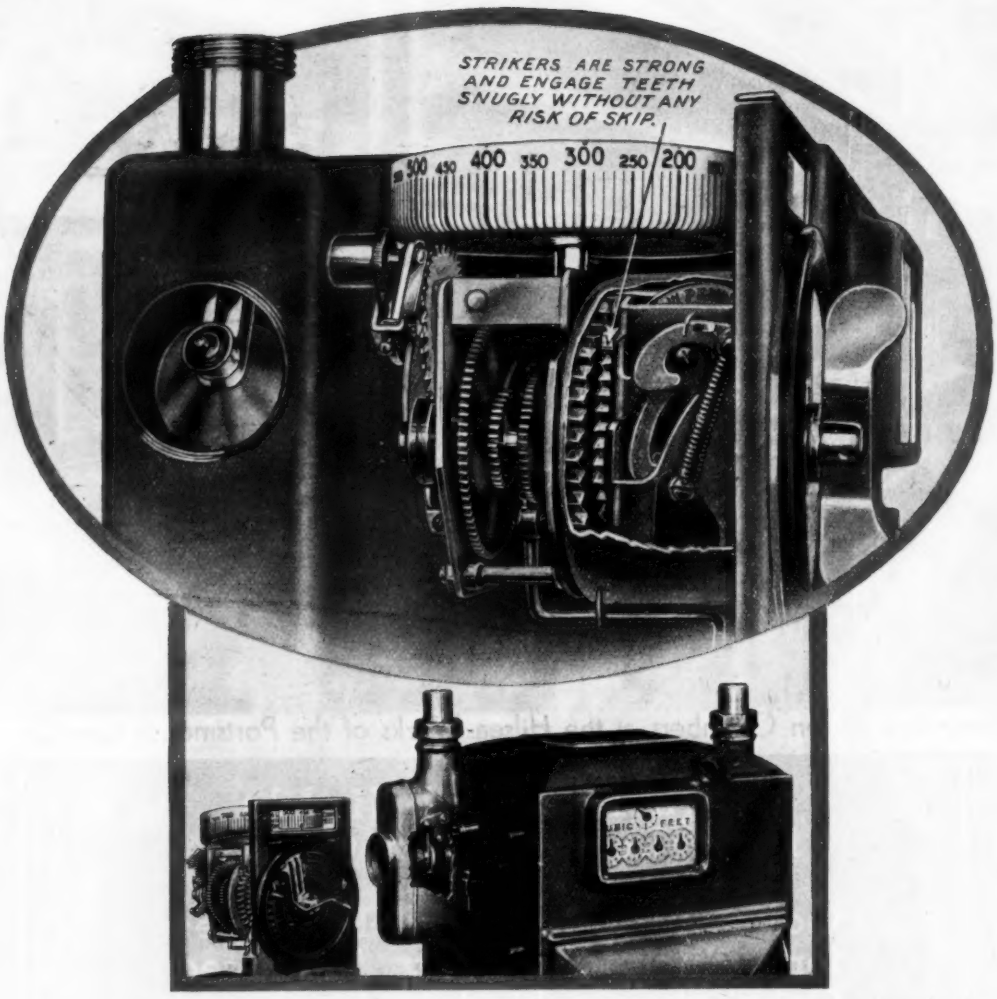

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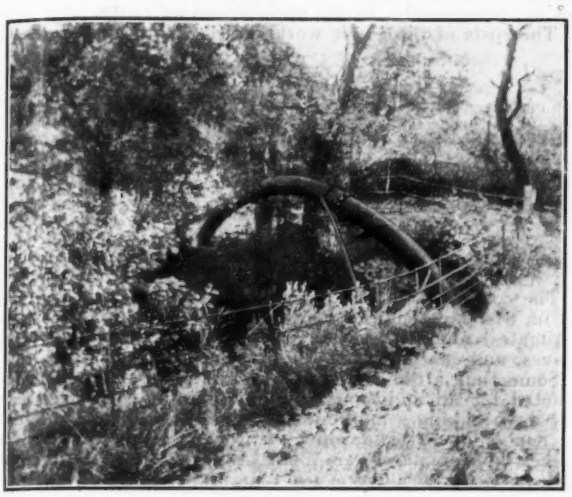
The Supply of Coke Oven Gas to Derby

By J. P. McCRAE

(Chief Engineer of the Derby Gas Light and Coke Company)

A Paper read before the Midland Association of Gas Engineers and Managers in Birmingham on Nov. 21



A pipe bridge of unusual construction over the River Ecclesbourne at Duffield.

The subject of coke oven gas as a substitute or alternative for manufactured coal gas, as usually associated with town gas supply, has been discussed in various quarters for several years; and although it may be assumed that the pros and cons of the subject are generally known to most gas engineers and administrators, it has not fallen to the lot of many to initiate and execute the engineering work associated with the introduction of coke oven gas to existing distribution systems.

The title of this Paper indicates, I hope clearly, that it is not my intention to discuss coke oven gas in all its ramifications, but simply to record without unnecessary elaboration the facts associated with the interesting engineering work executed in my own area of supply, in order that we might receive and market this commodity. It may here be noted that while some undertakings go many miles to achieve this object, others are surrounded by coke ovens and still manage to get along without taking a supply which one would expect to be financially attractive. The reason usually given in these cases is that 10% is earned annually and there is no immediate necessity to reduce working costs. Every projected scheme has a local aspect which is usually unknown to the looker-on, and it is obvious that conclusions as to the advantages or disadvantages of coke oven gas must not be arrived at hastily, although coke oven gas always sounds cheap at round about 1d. per therm.

Prior to 1932, Derby's gas area of some 135 square miles was supplied from three manufacturing stations, the largest of these, Litchurch Works, being replete with railway sidings and all modern mechanized plant; Cavendish Street Works with railway sidings a quarter of a mile away, otherwise up-to-date; and Belper with restricted railway facilities and out-of-date carbonizing plant. Various attempts had been made during a number of years to overcome the disability in connection with coal and coke handling at the two smaller works. A small high-pressure main connected Cavendish Street and Belper Works, but no direct gas communication existed between the important station (Litchurch) and the other two, except on the town governor outlets.

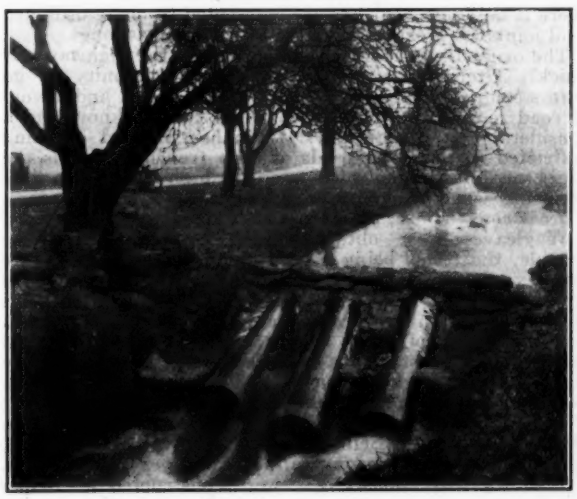
Like most other towns during the last few years, Derby has developed enormously, particularly on the outskirts, and satisfactory distribution of gas was becoming quite impossible, unseemly fluctuations in supply pressures being the necessitous rule. Further, three retort benches—one of nine beds of throughs at Litchurch, one of the six beds of throughs at Cavendish Street, and six beds of stop-ends at Belper—were under consideration for complete reconstruction or substitution. You will observe at a later stage in this Paper that these manufacturing stations and the distribution system were closely co-related in our consideration of coke oven gas.

Negotiations were opened with the Blackwell Colliery Company and afterwards with the Clay Cross Company, and immediately afterwards our chemists were at work in collating a mass of information as to coke oven gas, particularly with reference to fluctuations in quantity, calorific value, and the amount of impurities with which we should have to deal.

This investigation indicated that no basic trouble was likely to be associated under any of these heads, and agreements were drawn up incorporating the following clauses:

(1) Pressure at which gas was to be delivered to Gas Company's mains.
(2) Provision of purifiers and naphthalene washers.
(3) Quality of gas—average and minimum permitted.
(4) Quality of gas to comply generally with trial tests.
(5) Daily quantity (corrected to N.T.P.)—minimum and maximum with suitable provisions for public holidays and summer demands.
(9) Provision of gasholders at coke ovens for mixing purposes.
(10) Provision of supply main from outlet of compressors at coke ovens.
(11) Buyer's right to inspect coke ovens periodically to ascertain condition and make recommendations if necessary.
(12) Provision for interruption of supply through accidents, strikes, &c., and immediate notice thereof. Specified tonnage of coal and coke to be supplied over 21 days in the event of stoppage.
(13) Price of unpurified gas per 1,000 cu.ft., subject to slide on agreed basic price of coal at pit.
(14) Period of contract.

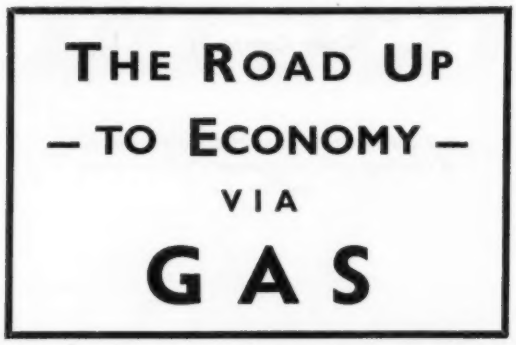
Powers were taken under the Derby Gas Order, 1930, to execute the necessary works, and permission was obtained to establish out of revenue a Development Fund to the amount of £100,000 for the purpose.



Bridging the Buckland Hollow Brook to lay 15-in. main below the bed of the brook.

The Work Entailed.

The work entailed by the Company included laying 15½ miles of main, mostly outside our statutory area of supply; erection of purification and naphthalene washing plants, 2 million cu.ft., gasholder, compressing plant, and other items incidental thereto, while both coke oven stations had to provide small gasholders for mixing purposes, compressing plant, test room, &c.



The type of notice used by the Derby Company in connection with their main laying combines utility with propaganda.

The usual calculations were made before concluding the size of main best suited for our purpose, considering first and running costs of compressing machinery, and possibility of future development. It was decided to lay a 15 in. class C. cast-iron spun pipe with Stanton-Wilson joints from Belper to the Shirland junction whence two 12 in. branches were laid to the coke ovens. Automatic clack valves were fitted at the junction to prevent flow in wrong direction. As the main had to be laid right through the town of Belper, there was naturally slow progress and considerable inconvenience to the public. This was the most unpleasant part of our programme, more particularly as within a few hours of our commencing operations on the highway, the insulation of a cable carrying 11,000 volts was pierced and various works in the town were put out of action.

Operations at the coke oven end were simultaneously carried out by machinery, an Allen Parsons trench excavator being employed for the purpose. This machine when working all out on good going, cut a trench 6 ft. deep by 2 ft. 6 in. wide much faster than we could lay pipes. Our record day for 15 in. main was 240 yds. laid, jointed, tested (after filling in trench between joints to prevent distortion) and proved at 100 lbs. per sq.in. air. For 12 in. pipe the record day's work was 256 yds. The excavator was an innovation and proved invaluable for rural work. Stanton pipes and the Stanton-Wilson joint proved very effective, although, as stated, the test pressure was severe. We faced all kinds of weather and other unfavourable conditions, and there is no doubt that had we attempted to make ordinary lead joints the work would have taken twice as long.

The original plan to lay the main along the highway was quickly altered and we seized every opportunity to go across country—the shorter route, easier going, and devoid of road re-instatement charges which, as you know, are a considerable item nowadays. Further, instead of being restricted to some 200 yards of open trench, which is the usual maximum when working on the highways, there were occasions when we had a trench open for a mile or more, a great convenience, tending to economical working.

Wayleaves were obtained with comparatively little trouble, the terms being helped by the fact that we were never very far away from a highway where the going was free. In no case did we pay an annual wayleave, but sums were accepted in every case varying from 3d. to 2s. 6d. per lineal yard of main, the latter being about half that charged for re-instating a metalled road. Simultaneously with the main work we constructed purifiers and naphthalene washing plant, at the coke ovens.

A new 2 million cu.ft. 4-lift gasholder, twin sets of single-stage double-acting Belliss compressors (with condensers), each capable of delivering 6 million cu.ft. per day at 10 lbs. per sq.in., valve house, &c., were constructed at Belper Works and coke oven gas was introduced on the evening of March 1, 1932, seven months after mainlaying commenced.

Gas was pumped through the 15½ miles of main to Belper Works at a pre-arranged rate, the main was cleared of air and the holder valve opened within half a minute of the calculated time, no mixture of gas and air being present owing, presumably, to the undulations en route.

The costs of the above works are tabulated hereunder:

	£	s.	d.
Purifying plant at Blackwell	7,571	4	9
,, ,, Clay Cross	6,187	15	4
Compressing plant, &c., Belper	7,140	12	7
Gasholder (steel tank, 4 lift), 2 million cu.ft. capacity	31,392	9	5
15 in. main, Belper to Shirland	27,626	18	9
12 in. ,, Shirland to Blackwell	7,182	17	7
12 in. ,, ,, to Clay Cross	8,449	15	4
Total	£95,551	13	9

The cost of 12 in. main per yard was 26s. 10d. and the 15 in. 34s. 11d. (figures which will not coincide with most estimates) and include all specials, valves, syphons, wayleaves, and charges other than official supervision.

Some time after completion of this programme we contracted for an additional million cu.ft. of coke oven gas per day, making a maximum of 4½ million cu.ft. available, to enable us to take which it was necessary to lay, in stages, approximately another 9½ miles of 15 in. main from Belper to Derby along a new arterial road, where suitable connections were made, so that not only was a ring main available to feed into the extremities of five separate districts (pressure being controlled by district governors), but also directly into each of the manufacturing stations at Derby, and it is fully expected that our distribution troubles are over.

The route of this main necessitated crossing the River Derwent (90 ft. span) and also the Ecclesbourne.

Purification at the Coke Ovens.

Purification at the coke ovens is not always essential, but in our case its advantages have far outweighed the expenditure on the necessary plant, both installations being supervised by one chemist, and the gas sold to other distributors in large and small quantities en route. There are further potentialities in this direction in view of our recent purchase of the Heanor and Langley Mill Undertaking.

Main-laying operations in progress for the Derby Gas Light and Coke Company.

There have been very few occasions when even slight trouble has arisen in respect to either quantity or quality of coke oven gas, and we must congratulate ourselves on having been able to work most amicably with the coke oven proprietors, whose collaboration has in every way been up to our expectations.

The following figures relative to the quality of gas from each of the coke ovens may be of interest.

Average Calorific Value over 12 Months' Working—September, 1934, to September, 1935.

Blackwell	510·3 B.Th.U./cu.ft.
Clay Cross	509·3 ,,
Belper	507·7 ,,

Declared C.V., 500.

Gas Analysis.

—	Blackwell.	Clay Cross.
Carbon dioxide	4·9%	4·5%
Heavy hydrocarbons	2·6 ,,	2·8 ,,
Oxygen	0·5 ,,	0·9 ,,
Carbon monoxide	10·7 ,,	10·1 ,,
Methane	25·6 ,,	25·5 ,,
Hydrogen	49·1 ,,	48·3 ,,
Nitrogen	6·7 ,,	7·9 ,,
Sulphur	18 grains	26 grains
Crude gas H_2S	500/550	500/900

You will note that the drop in calorific value as observed between the coke ovens and Belper Works is some 2 to 3 B.Th.U. Observations taken at Derby indicate that the further drop over the seven miles from Belper (where the gas is submitted to a slightly higher pressure) to Derby is some 3 B.Th.U., so that we are propelling the gas over a distance of some 27½ miles from coke ovens to works, including two compressions, with an ascertained loss of some 5 B.Th.U. per cu.ft. These figures are put in as a record of observation and not necessarily to be accepted as scientific facts.

The effects of compression with respect to moisture in gas at the three compressing stations are clearly indicated by the following table:

Effect of Compression on Moisture in Gas.

—	Dew Point.	Moisture, Grains/Cu.Ft.	Loss, Grains/Cu.Ft.	Galls. Water per Million Cu.Ft.	Decrease in Volume %	Increase in C.V. B.Th.U.
	°F.					
Clay Cross—						
Inlet to compressors	56·7	5·15	1·63	23·3	= 0·48	2·4
Outlet ,,	46·6	3·52				
Blackwell—						
Inlet to compressors	64·0	6·71	2·89	41·3	= 0·85	4·3
Outlet ,,	48·7	3·82				
Belper—						
Inlet to compressors	54·0	4·66	1·39	19·9	= 0·51	2·6
Inlet to Cavendish Street works	44·7	3·27				

Actual removal of water from syphons in the vicinity of the compressor outlets coincides very closely with the moisture content indicated by above figures and, owing to compression of gas, the dew point is always below ground temperature to the extent of about 7° F.

My Directors, on considering the possible effects of failure, either at the ovens or en route, and in order to provide for sudden emergencies, deemed it to be imperative that stand-by plant should be available; not only stand-by plant, but plant that could be manned and brought into effective action in a few hours.

For this reason we are now erecting at Litchurch Works an additional 3¼ million per day mechanically operated Humphreys & Glasgow carburetted water gas plant in order to provide a total water gas capacity of 6 million cu.ft. per day. The only deviation from the standard layout is that a twin cylinder horizontal gas engine will operate one of the blowing fans because it is assumed that if and when the plant is required there will be no time to get steam up on boilers. Besides, we are now making very little fuel at our own works, and a gas engine costs no more than a boiler, either to buy or to operate on a gas-works, and it is always ready at a minute's notice. Gas engines in any case should be found on gas-works if we expect other people to use them.

The repair and maintenance of gas-works plant when coke oven gas is purchased is an item which must be seriously considered. It may or may not be necessary to keep carbonizing and other plant in such condition that it can be operated satisfactorily in the event of a long stoppage of coke oven gas supplies, and it has yet to be found to what extent gas-works plant, ancillary machinery, waste-heat boilers, &c., depreciate through inaction. Retort house flues, for instance, in other than stage floor houses are obviously going to erode rapidly, while verticals and water gas plant which can be practically sealed up are unlikely to be materially affected by long spells of idleness. We intend to keep the whole of our plant in first-class order rather than risk any failures.

Any interruption in the gas supply, even for a short time, is unthinkable, and would result in very serious inconvenience to consumers and entail a serious loss to the Company.

The purified coke oven gas supplied last year was 1,201 million cu.ft., and manufactured coal gas 855 million cu.ft.

Having already stated that coke oven gas is not necessarily an attractive proposition throughout the country, let me now add that our average price for gas supplied since the introduction of coke oven gas has been reduced by, roughly, 2½d. per 1,000 cu.ft., which means that our customers have profited to the amount of £20,000 per annum, while our annual profits have not been reduced.

Discussion.

Mr. Ralph Halkett (Sheffield), in a written contribution to the discussion, stated that in his opinion it was the duty of every gas undertaker to absorb any surplus coke oven gas that might be available within a reasonable distance of their area. The excuse that full statutory dividends could be maintained at a reasonable charge for gas was futile, as there might be industrial uses for which cheaper gas could be of great benefit, and in any case there certainly was in every district a potential demand for gas at a rate lower than the ordinary domestic one. A gas undertaking should be considered to be in the nature of a trust where it was the duty of the owners to serve their consumers to the best possible extent, and every avenue should be explored to bring the cost down to the minimum.

He noted with interest that the Derby Gas Company had followed his Company in respect to their agreement, the heads of which were almost identical. He could confirm Mr. McCrae's experience with trench excavators, also as regards the value of trench excavators. They had two which were used whenever possible on their coke oven gas grid and had paid for themselves over and over again. They also laid one of their branch mains in Stanton spun pipes with Stanton-Wilson joints; these were remarkable for the speed with which they could be laid, and with a very little experience a good man could make the joints sound against a test pressure of 100 lb. without a single leakage. All their joints were tested with soapy water, and no joint was considered sound unless there was an entire absence of bubbles; even a bubble that took a perceptible time to fill and break they consider to be an indication of a leaky joint and one that must be re-made.

As regards wayleaves, they in Sheffield had arranged all those on their coke oven mains in perpetuity and paid a capital sum. In addition to this they had had several occasions to compensate farmers for temporary damage; it was their practice to employ an independent valuer to inspect the land and property both before and after they had laid the pipe line, and undoubtedly this had been the means of keeping down the valuation. He noted that Mr. McCrae made no mention of this item, and he would like to know how he had met such cases; if the portions laid across fields, &c., had had to be provided with syphons and what means of access was provided. Also how was the liquor from the syphons disposed of?

He noted that the Derby Company had installed purifiers and naphthalene washing plant at the coke ovens. He was interested to know what provision had been made in the event of the contract with either or both of the colliery companies being terminated by either side. With regard to the supplies *en route*, had any provision been made for maintaining a supply in the event of a stoppage at the coke ovens?

It was interesting to note that the Derby Company had been able to benefit their consumers to the extent of 2½d. per 1,000 cu.ft. due to the supply of coke oven gas. Derby had so far been more fortunate than Sheffield had. When they took upon themselves the responsibility of pioneering a Gas Grid Scheme they had to drop their price of gas to large industrial consumers to encourage them to extend its use. This had kept them back for three years, but he was pleased to say that they had now turned the corner, and nothing short of a serious setback in trade would retard their progress. It had been a great struggle; they had worked hard for the benefit of industry, and by so doing they had benefited everybody either directly or indirectly. He was pleased to say that their efforts were appreciated.

In 1928 their ordinary consumers were given the benefit of their early efforts in taking supplies of coke oven gas, but there was far more surplus gas than could be absorbed in that way; so they set out to obtain it for their local industries, and he claimed that they had been successful, that their foresight had been true, and that they could look forward to reaping some slight reward for their enterprise in the near future.

Mr. McCrae, in reply, remarked that he might possibly be regarded as having peculiar views, but, as regards price reduction, in his opinion it did not matter whether they tried to sell gas at 2s. 11d. or 2s. 9d. or even less, for if people wanted gas for domestic purposes they would not quibble; but for the industrial load it was a very different proposition. Mr. Halkett had referred to the fact that the heads of the clauses in the coke oven gas agreement were the same as theirs in Sheffield. This was natural; there was no need for people to carry out a job independently if it had been done already.

The wayleaves were in perpetuity just as Mr. Halkett's were. In one case, having paid compensation to the ground-owning

farmer, he had been threatened with a writ by the tenant in occupation to get off the land within twenty-four hours. Mr. McCrae had thereupon interviewed the valuer, whom he immediately engaged as his own valuer for the whole line of the main. Syphons were provided in the fields, and the means of access was by motor bicycle with the necessary equipment. The liquor from the syphons was innocuous, and it was dumped on the ground. In the event of the contract being terminated at the end of the twenty-one year period the Gas Company would remove their apparatus to another place; but they anticipated that they would be able to renew the contract at the end of the period. They had two boosters—at Litchurch and Cavendish Street—of 1½ million cu.ft. per hour, and these provided ample pressure.

An Advantage to Colliery Districts.

Sir JOHN FERGUSON BELL (Chairman and Managing Director of the Derby Gas Light and Coke Company) had written to Mr. Eunson on the subject of the Paper, and the President read this communication to the meeting. It was as follows:

It is opportune at the present time when there is controversy in the coalfield on the question of miners' wages for a Paper on a subject that will tend to bring much needed prosperity in many colliery districts. The coal industry is a very important one in this country; unfortunately both colliery owners and miners have for several years past been hard hit by acute depression largely in consequence of the decrease in coal exports and trade depression. There is no question in my opinion that gas undertakings within a reasonable distance from collieries where by-product coke oven plants are in operation and supplies of coke oven gas are available at moderate prices, should, as far as possible, take advantage of these bulk supplies, where they will operate to to the advantage of both collieries and gas undertakings, provided the all-in cost of such supply is really less than manufactured coal or carburetted water gas.

It must be remembered by both sellers and buyers that statutory gas undertakings must in the event of any failure in the coke oven supply have alternative stand-by plant available at short notice to make an equal quantity of coal or carburetted water gas, as any interruption in the town supply would be disastrous. This means a duplication of the gas manufacturing plant, which adds to the total cost of the coke oven gas. From the Board of Trade Returns for 1932, of the 834 statutory gas undertakings, 32 were purchasing bulk supplies of coke oven gas, and each year the number keeps increasing. The quantity purchased from coke ovens was 15,441 thousand millions of cubic feet; this is equal to 1/20th of the total gas made in Great Britain. From these figures it is evident that this important subject is one worthy of serious consideration by colliery and gas interests.

The excellent Paper by Mr. McCrae places the salient facts before you, so that those responsible in the Industry may give careful study to the various factors involved, so that every consideration may be given from a national point of view.

At Derby we erected purification plants at both the coke oven works with which we have long-date contracts, so that we could supply purified coke oven gas *en route* and extend the advantages to the villages. The experience now of some 3½ years at Derby of supplying some 60% of purified coke oven gas to manufactured gas has proved an unequalled success and enabled us to decrease the charge for gas to various consumers, especially to those who use town gas for industrial purposes.

The PRESIDENT asked what the position would be in the event of a stoppage at the colliery. He was interested in the Stanton-Wilson joints which had been tested to a pressure of 100 lb. As regards speed of laying, at Hereford they had laid 180 yd. in one day with Stanton-Wilson joints. He took it that the mechanical excavator worked in both hard and soft soils.

Mr. T. H. POULSON (Stafford) asked if Mr. McCrae would tell them whether any of the pipes were found to be cracked in the 15½ miles of main, when tested at 100 lb. They had recently laid about one mile of 15 in. pit cast pipes at Stafford, and in this length two pipes, apparently sound when laid, showed cracks when tested under pressure. These pipes might have been cracked in transit or at makers' works after testing, and it would be interesting to know Mr. McCrae's experience in this connection—especially as he had used class C. cast-iron spun piping.

He noted that in laying 15½ miles of main, every opportunity was seized to go "across country," although never very far away from the highway, and this, as Mr. McCrae emphasized, must have expedited and cheapened the operations enormously. It occurred to Mr. Poulson, however, to ask whether any precautions were taken to ensure that the mains so laid did not pass through any ground which was likely to be built on at some future date, and whether, in the event of the land being built on, was it contemplated to allow the main to remain under the property? As Mr. McCrae pointed out, any interruption in the gas supply, even for a short time, was unthinkable, and it was necessary to maintain the whole of the gas-making plant in first-class order as a precaution against failure of the coke oven gas supply. He expected that the cost of this maintenance had not yet been ascertained, but if it was known approximately it would be interesting to hear the cost per therm of gas sold.

Specific Gravity.

He noted that the water gas plant capacity at the Litchurch Works was being enlarged to bring it up to a total of 6 million cu.ft. per day, in order to provide for sudden emergencies caused by possible failures of the coke oven gas supply. He took it that in the not impossible event of such a failure it was quite probable that, for a time at any rate, the greater proportion, if not nearly the whole, of the gas sent out might necessarily consist of carburetted water gas. He might mention in this connection that some time ago, owing to repairs going on in their carbonizing plant at Stafford, they had recourse to carburetted water gas, which normally they did not supply, and found that with 60% or 70% of water gas—the remainder being steamed vertical gas—a great deal of trouble was experienced at consumers' burners, owing to the change-over to a gas of higher specific gravity. The specific gravity of the water gas they sent out was about 0·61, while that of the steamed vertical gas was about 0·48. He supposed that the specific gravity of the coke oven gas supplied would not be more than 0·45. He asked if Mr. McCrae contemplated any trouble in consumers' burners in the event of such a change-over becoming necessary.

He saw from the analysis that the coke oven gas contained 18 and 26 grains of sulphur as sulphur compounds from the respective sources. Did Mr. McCrae intend to remove the sulphur compounds? Mr. Poulson considered it only a question of time when this would be the rule rather than the exception as at present. There was no doubt that the presence of sulphuric acid in the products of combustion was a very objectionable feature in the use of gas for many domestic applications and a feature which should not be allowed to continue. It was incompatible with the high degree of status which they wished gas to occupy in the domestic heating and cooking field and a hindrance to their successful competition with electricity.

In conclusion, Mr. Poulson enquired where the twenty-one days' stock of coal was kept. Was it stored at the gas-works or at the coke ovens? He suggested that the coke ovens was the better place.

Mr. MCCRAE, in reply, stated that the contract provided for a gas pressure from the coke ovens of 5 lb. to 7½ lb. per sq.in. Subsequently they took another million cu.ft. of gas, and they had to visualize what the effect would be at the coke ovens. It might have resulted in their exceeding the limit of 7½ lb. in taking the additional million. However, it was all right at Blackwell, but in taking the extra quantity the pressure at Clay Cross was pushed up above the 7½ lb. figure; but they made certain arrangements whereby dispute in regard to this point would be avoided.

They were under the disability of not yet having completed their additional water gas plant at the gas-works. The works were only manufacturing 2 millions a day, whereas Mr. McCrae wanted seven millions. The remainder was made up of 4 million cu.ft. of coke oven gas and a little water gas. Therefore if the 4 millions should be cut off, only 2½ millions were available. They were making 2 millions a day at the works at the present moment, but they had taken the precaution of getting all their heats up in case anything should happen suddenly in the coal mining industry in the direction of a complete stoppage. They were not running any risks, and the gas-works were now ready to come into operation in a very few hours; so that it would not matter if the coke oven gas were cut off.

Damage to Main.

Mr. McCrae emphasized that the Gas Company did not buy the ground through which their main was laid. In regard to the question of cracked pipes, in the first length of main from the coke ovens to Belper they had no trouble at all. There was, however, a little trouble—which was entirely their own fault—between Belper and Derby. The trench had to be dug through a fair amount of rock, and in excavating the trench the supervisors were not sufficiently careful to remove all the knobs of rock from the bottom, with the result that when the local Council used a steam-roller over the filled-in trench on two occasions the gas pipe had been squeezed on to the rocky protrusions, causing cracks. So far as the land through which the main was laid was concerned, there was provision in all the agreements that in the event of the land being required for building sites, the Gas Company still retained the wayleave *round* the property, and they would have to divert the pipes at their own cost.

He was unable to visualize any great expense being involved as a result of erosion of plant laid by. With vertical retort plant and water gas sets he was of the opinion that they could almost forget the question of erosion, because such plant could be practically hermetically sealed. The cost per therm sold meant the average cost of the gas. The cost of maintenance would be a variable; but they were taking steps to remove two horizontal retort benches. The carburetted water gas plant would cost £20,000, and if it was locked up and not used at all it was only going to cost £2,000 per annum—which was a mere bagatelle.

In the event of the coke ovens being shut down they would be making 2 million cu.ft. of coal gas at the works, and although there might be a fair proportion of carburetted water gas at first, that would be cut down in a very short time by reason of the fact that they would immediately light up the horizontal settings, which they could get going in seven days. The specific gravity was a very important point, but they would not be confined to carburetted water gas, although they had on previous occasions sent out water gas and only water gas—for example, during the last coal strike. Mr. McCrae agreed that it was important to remove the sulphur compounds, and when somebody showed them how to do so on commercial lines they would do it. Their contract provided that coal should be available immediately there was any question or possibility of a strike. As a matter of fact, they had already purchased 1,000 tons of the 3,500 tons available and had put it into stock. He did not suggest that that coal should be carbonized at the coke

ovens because the ovens only produced 7,000 cu.ft. per ton, whereas Mr. McCrae could get 14,000 cu.ft. at the gas-works.

Coal Stocks and Strikes.

Mr. H. MATTERFACE (Monmouth) remarked that he felt that 1,000 tons of coal in stock was not a bit of good to provide against strikes. He was of opinion that wherever possible gas undertakings should take gas from coke ovens, and the two industries should be linked up. In his own district there was any amount of coke oven coke coming in, while the coke ovens also controlled the tar, which was further cause for agreement between the two industries. It also appeared to him that the gas undertaking which was taking coke oven supplies must keep its carbonizing plant to full capacity. If they increased their output they must also increase their carbonizing capacity. If settings had been let down it took a long time to heat them up again; his own experience was that it took six weeks to get them working again properly.

Mr. MCCRAE observed that Mr. Matterface had referred to the tonnage of coal on the assumption that when one was taking coke oven gas one did not want any coal in stock. But it was no use keeping carbonizing plant available if one had nothing to put into it. At Derby they always carried a normal stock of coal. The question of residual prices was of benefit to them because they had reduced their manufacturing output by two-thirds, and they obtained 1s. 6d. more per ton for their coke. He had found it of great advantage to have less by-products to dispose of, for they could obtain better prices for what they had. Assuming that their output was going to be only three or four hundred millions per annum they would still be justified in putting down more plant, but he would not dream of putting down more horizontal settings where they could get damp. In the first year that they took coke oven gas they shut down the whole of their plant except for lighting occasional "drying fires" during damp weather. But they had decided that even that was unnecessary. With vertical retorts or stage-floor houses the atmosphere had practically no effect upon the brick-work. It might have a slight effect upon steelwork, but that was looked after in the ordinary course of maintenance.

Practice at Chesterfield.

Mr. HAROLD DAVIES (Chesterfield) said he found fifteen years ago that gas was being supplied at 1s. 6d. per 1,000 cu.ft. That was uneconomic, and he had had the greatest difficulty in getting the price down to 6d. per thousand. The full purification of the gas at the ovens and the use of the leading main for distribution purposes along its entire route were policies which Chesterfield adopted fifteen years ago, and with gas at the present price from the ovens they were making the most of the opportunities thus afforded to distribute a large quantity of this gas daily, at prices which were economic for large-scale use. He suggested that Mr. McCrae was a little optimistic in his statement about the dew-point. He would like to know if naphthalene washers had been installed by his Company at Blackwell and Clay Cross, and was the cost included under the heading of purifying plant. As to the economics of the situation, coke oven gas round about 1d. per therm did sound cheap, and if one had to consider works reconstruction at a time when such coke oven gas was on offer, doubtless this would weigh in favour of coke oven gas if a reasonably long period agreement could be arranged. Chesterfield's average cost of putting gas into holders in 1933-34 was 9·95d. per 1,000 cu.ft. (without allowing for capital charges on manufacturing plant which would remain to be paid even if the plant was shut down). The total cost of a coke oven gas supply, based upon a figure of 6d. per 1,000 cu.ft. at the ovens, *plus* the annual charge on the leading main, stand-by plant, compensation to workmen, and repairs and maintenance of works (not coal gas manufacturing) amounted to 9·72d., and if the superseded steel main had to be written off in three years (as a matter of fact, the Ministry of Health would have insisted upon its immediate writing off as conditional to giving powers to borrow money to meet expenditure on the new main), the cost would then have been for the first three years 10·56d. It might well be asked "Where were the economies?" and it could only be answered by taking advantage of the opportunities afforded to increase total output.

Mr. MCCRAE, in reply, said that his Paper was not intended to be a boost for coke oven gas, and he had purposely refrained from mentioning the question of economics. In view of the fact that they still had in Derby some seven thousand wet meters he was not particularly concerned with the matter of dew point or gas-drying. Had it not been for the introduction of coke oven gas, their sales, which were at the moment considerably up—by 15 millions last month, or 9%—would definitely have been considerably down, because they had lost some 12,000 lighting consumers for no reason at all except that the Corporation were putting nothing but electric lighting in all their houses. Had it not been for the increased industrial load they might have been in a very serious state.

Common Problems.

Mr. G. DIXON (Nottingham) congratulated Mr. McCrae on his Paper. He had touched upon problems which were common to them all. He had mentioned that Derby was extending outwards in all directions, and he had showed them how he had tapped in to existing supplies from the coke oven gas main. There were times, however, such as the Sunday mid-day cooking period, when there was a maximum demand, and if they supplied consumers from the high-pressure coke oven gas main through governors he suggested that there might be times when that demand was greater than the hourly supply from the coke ovens, because the coke oven gas supply was a regular load. In such circumstances was the difference made up from holder capacity? He also enquired who operated the purifiers at the coke ovens. Were the Derby Company or the coke oven people responsible for this, and was the cost included in the price of the coke oven gas? Further, was there any clause in the agreement to enable the Gas Company not to have to take the full quantity of coke oven gas on any day? Mr. Dixon was of opinion that the risk of failure of the coke oven supply was no greater than the risk of failure at the gas-works, and it did not call for the maintenance of the whole carbonizing plant in full working order, for this had an important bearing on the economics of the whole question. In conclusion, he asked if there was any clause in the agreement to prevent the coke ovens sending their coke into the Gas Company's area.

Mr. F. SHEWRING (Stratford-on-Avon), speaking in regard to the moisture content in the gas, asked if Mr. McCrae could inform them if the gas compression was effected at the coke oven works with a view to bringing down the water vapour before the gas was pumped to the various districts.

Mr. MCCRAE said the pressure fluctuation effect upon the district governors in any district was a disability where there was a varying demand. If the governors were set to provide for the Sunday cooking load and were not altered subsequently, then the weekday pressure would be excessive. In their case they set the governors to supply the normal demand and operated boosters at the works to provide for the additional demand on Sundays. The gas was pumped straight into the Belper gas-holder, and there was only one small bulk supply taken from that main. After that the matter was in the Gas Company's own hands. They adjusted the pressure at Belper according to the position of the holders at Derby, so that they never got below a sufficient pressure to hold the governors in position. The purifiers at the coke ovens were controlled by the Gas Company at their own cost, the personnel being provided from local workpeople at the coke ovens. The cost of purifying at the coke ovens was 0·4d. per 1,000 cu.ft. of gas. The differential rate at Blackwell was 1½ to 2 million cu.ft. at the Gas Company's option, though they were now taking an additional million. During holiday periods they had the option of reducing the agreed quantity by 50%. The costs which he had mentioned in the Paper included the gasholder at Belper, which would have had to be erected irrespective of whether they were taking coke oven gas or not—so that this sum could be knocked off the total cost straight away. The question of risk in regard to the taking of coke oven supplies was purely relative. He was still of the opinion—apart from the instructions of his Directors—that the right thing in their case was to make provision for possible stoppages. There was no clause in the agreement in regard to the flooding of their market with coke oven coke, but they had an understanding with the coke oven authorities that they would not do this. In regard to the compression of the gas, immediately after compression 90% of the water was deposited at the first syphon, and there were syphons on the run of the main out of which they had not yet had any water at all. This question all depended upon the locality.

A hearty vote of thanks to Mr. McCrae for his Paper was accorded on the proposition of Mr. H. DAVIES, seconded by Mr. G. DIXON.

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It is one thing to reduce the price of gas, but quite another to profit by the potentialities so created to increase the sales of gas. While the consumer may be fully advised of a reduction by circular, advertisement, or personal call by the undertaking's representative, the advantage is often regarded in what one might term the negative light of reducing his gas bill rather than as an added opportunity of availing himself of greater gas service.

It will be recalled by our readers that last September the Newcastle-upon-Tyne and Gateshead Gas Company revised their domestic tariff, and launched the new rates by means of a publicity scheme on the customary Newcastle scale. This excellent propaganda has been further strengthened by the distribution of 10,000 copies of a delightful booklet entitled "The Home of To-Day." The reason for the existence of the publication is found in a brief preface: It is the object of this Booklet to convey to readers how the work and dirt involved in the use of solid fuel can now be eliminated from every home by the use of a fuel unequalled in convenience, reliability, and suitability to the most exacting requirements, at a low cost.

The publication treats each room of a typical house in turn and coloured illustrations portray suggested installations in each particular case. The running costs of each appliance are supplied, and with the revised tariff in operation these work out at very low figures. Mention is also made in the booklet of the Company's free kitchen-planning service. Details of the domestic tariff conclude this sales compelling publication, and a post-card is included for the consumer to reply, postage free, by putting a cross opposite the items which interest him most.

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DEVELOPMENT AND FUTURE POSSIBILITIES OF

Gas as an Industrial Fuel

by

JOSEPH E. WHITE

(Industrial Gas Sales Manager to the Newcastle-upon-Tyne and Gateshead Gas Company)

A Paper read at a Joint Meeting of the Manchester District Association of Gas Engineers and the Institute of Fuel (North-Western Section) at Manchester on Wednesday, Nov. 20.

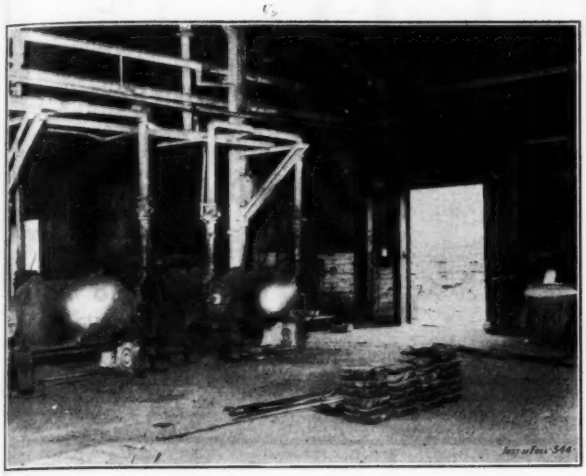

Fig. 1.—Gas-fired semi-rotary brass melting furnaces—capacity, 300 and 400 lb. (brass).

Economic justification is a prime necessity for the progress of any industry or the sale of any commodity in such an area as Tyneside. It has, therefore, been the policy of the Newcastle and Gateshead Gas Company to offer gas at a price which would be economic, and, consequently, attractive to the industries operating within its area of supply.

The development of the use of gas in industry depends to a large extent upon the price at which the gas can be offered, and it is my belief that if the Gas Industry is to show marked progress in its sales during the coming years it will be through the medium of specially priced gas. A little study of the results of those undertakings which are known to be offering gas to industry at attractive rates will prove beyond question that the specially priced industrial gas load is well worth the effort made to secure it. The passing of time will prove how important the industrial load can be to the welfare of the entire Industry.

It is not necessary to detail here those expense-incurring factors affecting the price of gas; it is necessary, however, to consider the economic relationship between the costing conditions of both the manufacturer of a fuel and its consumer, and in this respect one would again venture to suggest that the Gas Industry might well consider the methods of the motor car industry.

Anticipatory costing has enabled many world-famous firms to offer to the public motor vehicles which are double the value of the models offered to them less than ten years ago at half the then cost. The Gas Industry must arrive at a fuller appreciation of the relationship between the true economic value of gas fuel and the industries of the district. By doing so, it can by the same costing methods do the same big business as the motor industry, which, by its ready appreciation of what the public wants and what the public can afford to pay, has grown almost beyond recognition. Exactly the same applies to gas. Industry realizes the value of gas and therefore wants gas, but it wants it at its true economic value; in other words, at what industry can afford to pay. It is therefore desirable that the gas undertakings should arrive speedily at a definite conclusion as to what such extra consumption truly costs and what is a reasonable profit to expect from such a consumption.

To illustrate this point one could mention a gas undertaking in North-Eastern England which, without the aid of coke oven gas, is selling gas to the iron and steel industry at 1s. 2d. per 1,000 cu.ft. for nine months of the year and at 1s. 3d. per 1,000 cu.ft. for the remainder. The difference between the manufacturing costs and selling price may only be 2d. per 1,000 cu.ft., but one would suggest that for an annual load of 50,000,000 cu.ft. it cannot be regarded as anything other than good business, especially when it is remembered that no charge can be reasonably placed against this extra consumption other than the net coal and a little extra labour involved in the handling of it. In the instance just quoted, industry (in the form of a rolling mill) required a fuel capable of accurate temperature and atmosphere control for the close annealing of high grade steel sheets. A full investigation of its own internal costs showed that, although the gas producer gas plant already installed could deliver heat at not exceeding 1¾d. per therm, there was an anticipated market for a high-grade product which could justify town gas at 3d. per therm as an absolute maximum, that figure per therm being equal to the cost which would be involved by producer coal, wages, repairs, and renewals of producer plant, *plus* the value of an increase in mill throughput and the abolition of those expense-incurring factors associated with the formation of scale.

Heat is required in almost every form of industry. There are, therefore, considerable possibilities open to the Gas Industry in trades and processes where the cost of such heat is of little or no consequence—for example, some of the smaller commercial uses. Again, there is a very considerable field of development when gas is available at approximately 4d. to 5d. per therm; this field includes all forms of light engineering. There are enormous possibilities for gas in the regions of cheap solid fuel. In such regions it is generally found that surplus coke oven gas is being taken by local gas undertakings which, in such circumstances, should be able to supply gas in bulk to industries to whom it is definitely attractive at 2d. to 2½d. per therm.

The industrial gas load in the area of the Newcastle and Gateshead Gas Company is somewhat unique. This load, representing some 7,344,324 therms, is 29·4% of the Company's total gas sales and is made up in rather remarkable percentages—for example, 45% of the industrial and commercial consumers consume only 4% of the gas sold to that class, while ½% of the number of industrial and com-

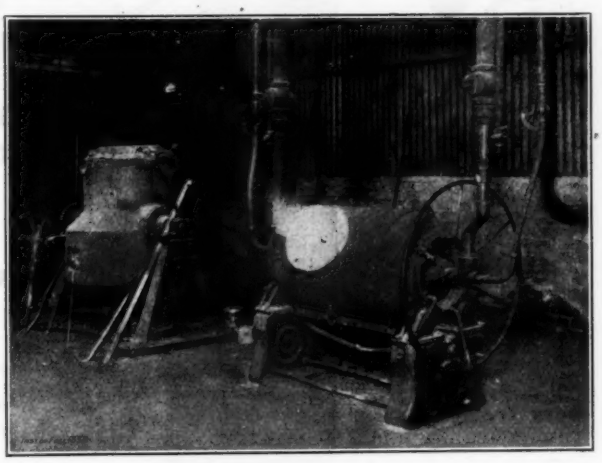

Fig 2.—Gas-fired semi-rotary and tilting furnaces for aluminium melting.

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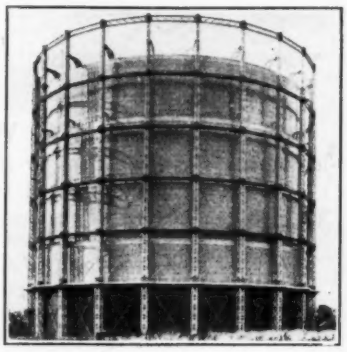

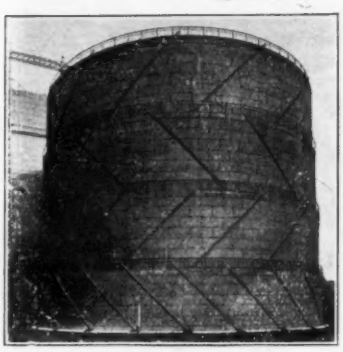

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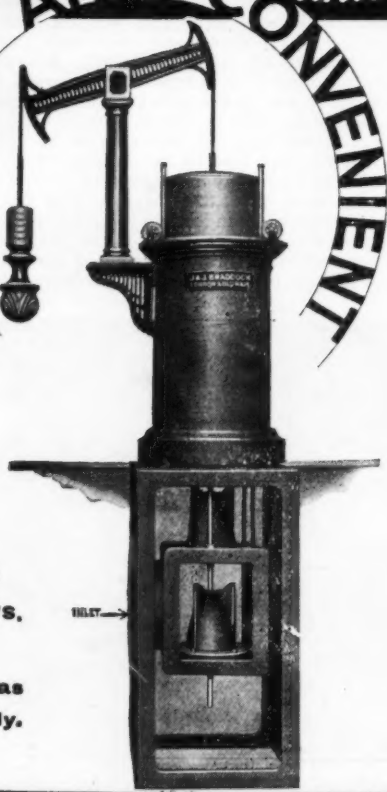

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mercial consumers each consume over 10,000 therms per annum and represent in total 42½% of all gas sold for industrial purposes and 21½% of the total gas sold by the Company through ordinary meters for all purposes. From the foregoing it will be seen that the Company has an enormous number of very small consumers, and a very small number of really large ones. In 1929 competition from fuel oil, solid fuel, and electricity made necessary a tariff which would, as far as possible, meet these widely diverging conditions. This tariff increased the 1929 consumption of 3,072,000 therms to 3,545,121 therms in 1934. Actually those consumers taking gas at two-part tariff rates together with those taking gas at special contract rates showed an increase of 150,750,000 cu.ft. for 1934 and have shown a further increase of over 118,000,000 cu.ft. on the first nine months of this year.

The many outstanding advantages due to the characteristics of town gas as an industrial fuel are so well known as to be hardly worth while reiterating; there are, however, certain factors worthy of consideration since they play a vital part in many of the installations afterwards described.

Town gas constitutes in itself a fuel of extremely uniform quality. This factor is greatly appreciated by users of plant which is continuous in its operation—*e.g.*, glass-melting of furnaces requiring uniform temperature all the year round.

The maintenance costs of furnaces fired with town gas are considerably lower than where other forms of fuel are employed. Reference to the detailed costs of a rolling mill installation given later will illustrate beyond question the extent to which maintenance can influence final cost. The ease with which fuel in the form of gas can be measured for any particular operation is of the greatest service to modern cost accounting methods since it entirely eliminates those on-costs which, under the headings of handling, storage, and the removal of waste, can create a totally false impression of the final cost of a closely costed article.

When the capital outlay is of importance gas has further appeals, the burner equipment employed is in most cases simple in design and low in first cost; furthermore, where high temperatures are contemplated the employment of town gas renders unnecessary tall chimneys which are costly to build and maintain.

The control of excess air used for combustion can be reduced to a minimum, thus making possible high efficiency in furnaces of simple, robust construction employing direct firing. The significance of this feature is at once apparent to those who are familiar with high temperature furnaces used for forging or drop stamping, experience having shown how difficult it can be to maintain in an efficient condition any form of heat recovery system where slagging or excessive vibration is encountered.

Without in any way detracting from their individual importance there can perhaps be grouped together automatic control, increased output, and the elimination of spoiled material. The importance of these features is now fully realized; they are the basis of all sound production methods, and, since gas can guarantee them, it is not surprising that progressive managements look more and more to this form of fuel.

During the past twelve months considerable development has taken place in the use of gas in the non-ferrous metal industries covering melting, extruding, annealing, sheet and strip rolling and annealing, also the annealing of brass work for cold working.

Melting of Non-Ferrous Metals.

Some seven months ago the foundry illustrated in figs. 1 and 2 changed over from fuel oil to gas on three semi-rotary furnaces, two crucible pot furnaces, and one tilting crucible furnace. This change-over was of considerable interest as it covered both in-flame and crucible furnaces, giving an excellent opportunity to study the full aspect of the melting problems on both types of furnace. Detailed below are the first day's results; when considering these, however, it must be borne in mind that the furnace started from cold, had just been re-lined, and was in the hands of men with absolutely no previous experience of this type of furnace when heated by gas.

Perhaps more interesting than this test taken under somewhat unfavourable conditions is the consumption figure taken upon the total foundry output over a period of months. For the melting of 1,126,921 lb. of brass, aluminium, &c., some 7,696,800 cu.ft. of gas were consumed, representing a consumption of 6·83 cu.ft. per lb. The price of gas to this foundry is 2·475d. per therm, representing a cost per lb. of 0·1d.; when operating on fuel oil at 84s. per ton the fuel cost was found to be 0·1314d. per lb., representing quite a substantial saving on an output of over 500 tons per annum. This installation has entirely disproved the belief that it is difficult to obtain satisfactory castings from gas-fired in-flame melting furnaces, the castings obtained being equal in all respects to those obtained with oil firing.

Extrusion of Non-Ferrous Metals.

The economic value of gas in relation to fuel oil is further illustrated in the recent conversion of an efficient oil-fired continuous furnace used for the heating of brass billets for a large extruding press. This furnace, 15 ft. long by 3 ft. wide, having a fall of 2 in. on the length of the hearth, was previously fired by six oil burners situated in the furnace arch firing downwards on to the slowly moving billets. It will readily be observed that any delay on the extruding press at once stopped the forward movement of the billets, resulting in at least three of them being checked directly beneath the oil burners; this, of course, led to the burning or melting of the edges of the billets, causing either stains or unsound material in the finished extruded section. Such stains could, in the course of a shift, represent a loss equal to the total cost of the fuel used during that period. The performance asked for when considering gas was somewhat exacting, the throughput ranging from 25 cwt. to 3 tons per hour, allowing for a heating period not exceeding one hour

Test on 300 Lb. Armstrong Whitworth Semi Rotary Brass Melting Furnace.

Operation and Nature of Charge.	Time.	Meter Reading.	Consumption.	Consumption per Lb.	Remarks.
		Cu.Ft.	Cu.Ft.	Cu.Ft.	
Lit up	9.10 a.m.	3,200	..	..	..
1.—Charged 300 lb. Cu.	9.30 ,,	3,600	400	..	..
Spelter added	10.40 ,,	6,200	..	..	Gas off 3 mins.
Poured	11. 0 ,,	6,800	3,200	10·66	Cast.
2.—Charged 300 lb. Cu.	11. 5 ,,	6,900	..	..	..
Spelter added	11.45 ,,	8,300	..	..	Gas off 3 mins.
Poured	12. 0 Noon	9,000	2,100	7·0	Cast.
3.—Charged 400 lb. brass	12.10 p.m.	9,200	..	..	..
Melted	12.40 ,,	10,200	1,000	2·5	..
Poured	1. 5 ,,	10,800	1,600	4·0	Cast.
4.—Lit up	1.30 ,,	10,800	..	..	..
Charged 300 lb. Cu.	1.40 ,,	11,300	..	..	..
Tin, lead, and Ph. Bz. added	2.25 ,,	12,800	1,500	4·4	Gas off while mixing 60 lb. tin, and 12 lb. lead and Ph. Bze.
Poured 412 lb.	2·40 ,,	13,100	1,800	4·35	Refined and poured into moulds.
5.—Charged 340 lb. Cu.	2.55 ,,	13,400	..	..	..
Tin, lead, and Ph. Bze. added	3.30 ,,	14,600	1,000	2·91	Gas off while mixing.
Poured 412 lb.	3.35 ,,	14,600	1,200	2·9	Refined and poured into moulds.
6.—Charged 400 lb. Gunmetal	3.55 ,,	14,900	..	..	..
Melted	4.25 ,,	15,900	1,000	2·5	..
Poured	4.40 ,,	16,300	1,400	3·5	Cast.
Gas off	4.43 ,,	16,400	..	..	..

SUMMARY OF RESULTS.

Duration of test	9.10 a.m. to 4.43 p.m. (details as above)	Total gas consumed	13,200 cu.ft. (500 B.Th.U. gas)
Throughput	Six heats representing 2,224 lb.	Gas consumed per lb. of metal	5·9 cu.ft.

Fig. 3.—Battery of six gas-heated furnaces for the rolling of non-ferrous sheet and strip.

in which the largest solid billets some 8 in. diameter by 2 ft. 3 in. long should travel the length of the furnace and be raised to 1,550° F. from atmospheric temperature. Gas burners working with an automatic proportioning system of the British Furnaces type were installed in three zones; the first zone, farthest away from the discharge end of the furnace, being used as preheater, the second and the final zone being used for heating and soaking. As the burners fire tangentially to the furnace arch there is an entire absence of direct flame impingement upon the billets, consequently burning and damage have been entirely eliminated. Comparison of fuel costs on this furnace is interesting. Fuel oil at 84s. per ton gave a cost of 3s. per ton of metal extruded; on gas 2,000 cu.ft. are being consumed per ton, representing equal costs with gas at 1s. 6d. per 1,000 cu.ft. or 3·6d. per therm. It will be seen, therefore, that it is possible to account for the difference between approximately 2·4d. per therm for oil and 3·6d. per therm for gas by increased thermal efficiency. To this, of course, must be added the value of the metal previously wasted and the value of the greatly decreased furnace maintenance now experienced. These figures are the results of a costs analysis at the end of six months' operation.

Rolling and Annealing of Non-Ferrous Metals.

The rolling and annealing of brass, copper, and aluminium sheet calls for furnaces capable of a high degree of temperature uniformity despite frequent opening of the furnace door. The furnaces illustrated in figs. 3 and 4 are used for the rolling and annealing of high-grade non-ferrous sheets. As these sheets are rolled to very fine limits it became necessary to devise a burner layout which would be sufficiently flexible to make up door heat losses and at the same time avoid any tendency towards higher temperature at the back of the working chamber. These furnaces, varying in size between 8 ft. 6 in. by 6 ft. 6 in. by 2 ft. 4½ in. and 12 ft. 6 in. by 6 ft. 6 in. by 2 ft. 4½ in., operate at a temperature of 925° C., thus giving rapid output. Working at this temperature, however, it will readily be appreciated that very little temperature difference is required to melt the edge of the sheet and an even smaller temperature difference is needed to make the sheet thinner at the hot end when rolled. To obtain satisfactory results six burners have been installed on each side of the furnace, the twelve burners installed having been divided into groups of four, each group being under separate control. In service all burners are used to bring the furnace up to temperature, but when sheets up to 12 ft. in length are being rolled it is found desirable to operate the four burners nearest the door at their full capacity, the next group at approximately 60% capacity, and the rear group at 25% capacity or in some cases entirely out of commission. When fired by good quality furnace coal one furnace 9 ft. by 6 ft. 6 in. by 2 ft. 4½ in. required 4 tons per week; operating for a working week of 47 hours, the same furnace on gas consumes 78,000 cu.ft.; this figure includes the heating up of the furnace, which is closed down from 5 p.m. to 6 a.m. daily. When heated by solid fuel twelve hours were required to reach a satisfactory working temperature after a week-end shut down. With gas firing, material is rolled from the furnace within two hours of the furnace being lit up from cold—it is not necessary to detail the obvious savings effected thereby.

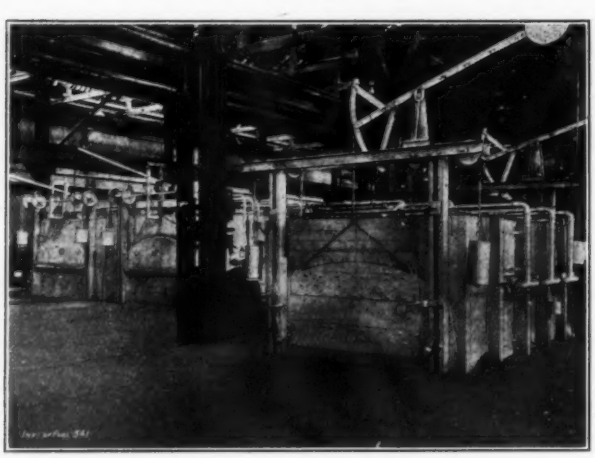


Fig. 4.—Two of the rolling furnaces illustrated in fig. 3. The furnace in the foreground is used for annealing purposes.

Annealing of Brass After Cold Working.

In the annealing of brass after cold working, similar temperature limitations have to be faced; they are, however, perhaps more exacting and a little more difficult to guarantee, the required temperature being substantially lower than in rolling. Of the six furnaces illustrated in fig. 5 four have a working range of 550° C. to 700° C. and two a working range of 240° C. to 260° C., all being subject to a temperature tolerance of not exceeding *plus* or *minus* 5° C. at any part of the working hearth. The furnaces are

Fig. 5.—Battery of six gas-fired furnaces used for the annealing of cold drawn brass work.

10 ft. back to front and 7 ft. 9 in. wide, the arch rising 12 in. to 1 ft. 10 in. high. Each furnace handles 8 or 9 charges of brass pressings per day, each charge weighing 10 cwt.; the charge is cold when entering the furnace and is raised to a temperature of 635° C. in 50 minutes. It is held at this temperature for 20 minutes and then withdrawn to be followed by another similar charge. These furnaces have been in operation 9½ to 24 hours per day since their installation over a year ago and as yet have not cost one penny for repairs, renewals, or servicing. Regarding gas consumption, the following is indicative of the performance of the first two furnaces completed.

Week Ending—	Total Furnace Hours.	Estimated Consumption.	Actual Consumption.	Average Consumption per Furnace per Hour (Actual).*
	Hours.	Cu.Ft.	Cu.Ft.	Cu.Ft. per Hour
July 27, 1934	108⅝	136,550	123,000	1,132
Aug. 3, ,,	125	156,100	148,700	1,190
,, 10, ,,	105¼	131,550	120,100	1,138
,, 17, ,,	121½	151,700	131,000	1,088

* The average figure includes the gas used for heating up from cold each morning, day shift only being in operation.

Temperature uniformity has led to an enormous reduction in the wear and tear on the press tools, while the

Fig. 6.—Battery of three gas-fired carburizing furnaces used for locomotive and heavy engineering components.

almost completely "neutral" furnace atmosphere has led to a reduction of 75% in the amount of sulphuric acid used for pickling purposes following each heat. Within the last week we have received an order for a seventh furnace similar in all respects to the six now in operation.

Carburizing.

Some six years ago it became alarmingly apparent that for continuous heating processes the design of gas-fired furnaces would have to be modified and improved if they were to compete with their electrically heated rivals. In the past gas furnaces had been built down to a price and consequently not always designed or constructed with sufficient care, the consequence being an uneconomical consumption of gas. For the process of carburizing, furnaces have now been designed and are in operation all over the country which adequately meet electrical competition. The furnaces are insulated at the sides and over the arch of the chamber with 14 in. of insulation, thus reducing radiation losses to a minimum. For heavy work charging machines are used (see figs. 6 and 7); advantage has therefore been taken of the slots for the charging machine arms to provide outlets for the products of combustion which, passing into recuperation flues, flow in a contra-flow direction to the incoming secondary air, eventually reaching the stack at a remarkably low temperature. Injectors are fitted to the burners to enable primary air to be taken into the burners when the furnace is first lighted up from cold, but in operation of the furnace this primary air is shut off entirely as soon as colour appears. The whole of the air required for combustion is then supplied through the recuperator, resulting in a drop in temperature in the outgoing products from 930° C. in the furnace chamber to 130° C. at the foot of the stack. The result of the reduction of radiation losses together with the all-round improvement in thermal efficiency, is perhaps best illustrated by the following data which cover the old and new type gas furnaces and an electric furnace, all engaged on precisely the same work. The price of gas is taken as 2s. per 1,000 cu.ft. and electricity at 0·6d. per unit, the results being taken over a full week's operation.

	Old Design.	New Design.	Electricity.
Total load	13,890 lb.	13,032 lb.	14,703 lb.
Fuel consumption, total	93,450 cu.ft.	44,310 cu.ft.	2,780 KW.
Consumption per hour	795 ,,	415 ,,	20·5 ,,
Consumption per lb.	6·73 ,,	3·72 ,,	197 watts
Cost per hour	18·9d.	9·88d.	12·3d.
Cost per lb.	0·160d.	0·089d.	0·113d.
Time occupied	117 hrs. 45 mins.	106 hrs. 50 mins.	135½ hrs.

Clearly the cost per lb. has been nearly halved. These figures were taken, however, before final adjustments had been made. In a subsequent test the heat consisted of a 16 cwt. load consuming an average of 693 cu.ft. over a period of 14 hours 15 minutes. For the remaining 92 hours 35 minutes of the week the average consumption was 372 cu.ft. per hour, representing a cost of 8·8d. per hour or 0·079d. per lb., which may be said to compare very favourably with the electrical costs of 12·3d. per hour or 0·113d. per lb.

The thanks of the Gas Industry are due to the City of Birmingham Gas Department for the research work undertaken by them which eventually led to the development of the furnace just described.

Rolling of Steel Sheets and Plates.

Perhaps our most ambitious attempt has been the conversion of a typical Siemens 20-ton rolling mill reheating furnace. The furnace designed and built for producer gas supplied from built-in producers, is engaged in the production of ordinary mild steel sheets and plates, a commodity which, at to-day's market prices, cannot afford a fuel which can in any way be regarded as a luxury. In such circumstances, producer gas generated from coal costing 14s. per ton delivered can represent an extremely formidable competitor.

Alteration to the existing furnace was made in one respect only—that of cutting off the producer gas ways and substituting a multiple town gas port below the air ways from the regenerators. No alteration was made in either the regenerator capacity or the combustion space; a certain amount of experimental work was involved, however, in getting sufficient "travel" upon the flame to ensure a good heat right up to the furnace doors.

The final results have proved altogether satisfactory and, as the following data illustrates, high efficiency is readily possible with town gas on such furnaces:

Total throughput	430 t. 3 c. 2 q.
Total gas used (including that used in heating up furnace on Tuesday and Sunday)	1,452,000 cu.ft.
Gas consumed per ton (1,452,000 cu.ft. on 430·175 tons)	3,377 ,,
Cost at 2·475d. per therm (1s. 0½d per 1,000 cu.ft. of 500 B.Th.U. gas)	3s. 5¾d. per ton of rolled weight
Gas used in heating up furnace (Tuesday 6 a.m. to 2 p.m.)	59,900 cu ft.
Gas used in heating up furnace (Sunday midnight to 6 a.m.)	45,200 ,,
Total gas used in heating up furnace	105,100 ,,
Gas consumed per ton (not including that used in heating up furnaces)	3,130 ,,

To arrive at the true producer gas costs is not an easy matter; so many factors enter into these costs that unless a most exacting record is kept, there is a decided tendency to regard producer gas as having a cost per therm very much lower than is actually the case in service. Fortunately the mill owners in question were able to give a detailed account of all that has been spent on the furnace and producers during the six months prior to the change-over to coal gas firing. When six months' service with gas firing had been completed under the same exacting conditions, the results were analyzed and the costs of the two systems of firing closely compared. The following results may therefore be regarded as an indication of the true

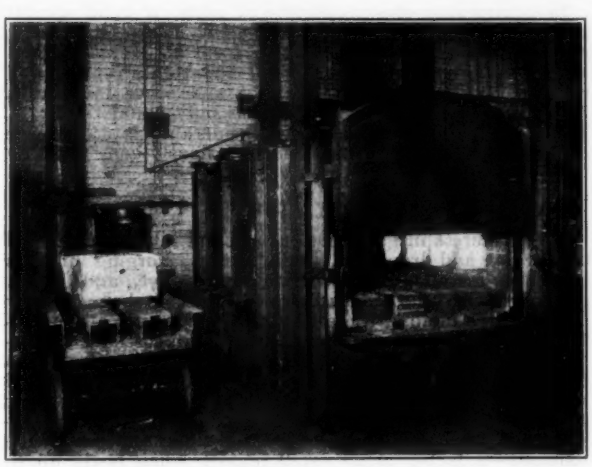


Fig. 7.—Furnace as in fig. 6. Note charging machine slots in furnace hearth, also automatic temperature control gear.

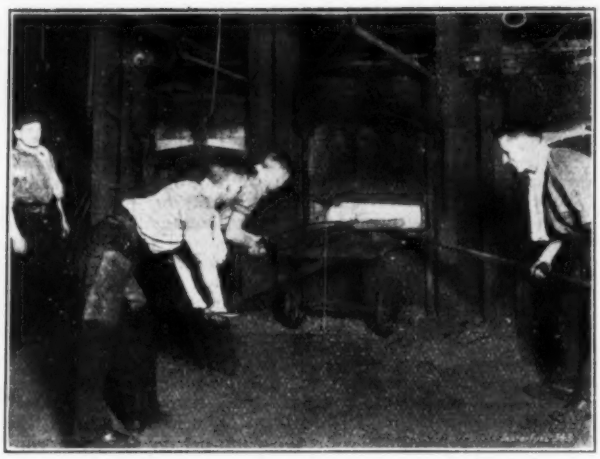


Fig. 8.—Steel works mill furnace heated by town gas—having an output of 60 tons per 24-hour day.

producer gas costs and the general suitability of town gas as a fuel for steel works re-heating furnaces:

Comparative Results of Producer and Town Gas in Steel Works Reheating Practice.

Cost of total sheared weight, rolled and annealed.

Producer Gas. Jan. 1 to August, 1932. Make, 2,187 tons.	£	s.	d.	Town Gas. Sept., 1932, to Feb. 28, 1933. Make, 1,635 t. 12 c. 1 q.	£	s.	d.
Gas producer's wages	97	8	2	Coal, 192 t. 2 c.	142	16	7
Repairs to furnaces and gas producers	185	6	3	Gas, 8,072,300 cu ft.	416	4	4
Removing ashes, &c.	99	0	0	Repairs to furnace	12	16	6
Coal, 605 t. 6 c.	415	9	10				
	£797	4	3		£571	17	5

A comparison of the above figures shows that the thermal efficiency of the furnace has been increased by no less than 290% and that there is a direct financial saving, by the use of gas, of 5%.

There are, however, additional advantages, such as a decreased consumption of electrical energy on the mill motors brought about by more thorough heating of the slabs, some of which are over 1,200 lb. in weight, reduction in loss of weight by scale, and the saving effected in repairs on steam plant previously required for the gas producers; the total saving may therefore be said to be between 8 and 10%. Gas must also be credited with the production of better sheets and plates than had even been previously possible.

In considering the producer gas costs, it is of special interest to note the extent to which such charges as labour, repairs, and renewals affect this form of fuel. For example, wages represent 12·1% of the total, repairs and renewals 23·2%, removal of ashes and other incidentals 12·5%, while the actual fuel used is only equal to 52·2%. The last-mentioned item is of considerable interest since only too often it is the only factor seriously considered by producer gas users.

Heavy Forging.

Keen interest in gas fuel is now found in all branches of the forging and drop stamping industry. Forging furnaces have been installed for serving 45 cwt., 35 cwt., and 15 cwt. hammers with marked success, this success being chiefly due to three factors, these being reduction in scale formation, increased output, saving in labour cost due to decreased lighting-up charges (a time-saving of at least two hours per day being effected), and finally an improved product. The last-mentioned factor is due to the fact that the furnace man previously part-time engaged at the furnace fire is now available for full-time service at the hammer—a factor of no small import when heats up to four tons are being handled. While it is almost impossible to give a consumption per ton of throughput in view of the number of re-heats to which a forging of any size is subjected before it reaches its final shape, it is interesting to note that the amount of work done by 10 to 12 tons of coal is now done by 137,000 cu.ft. of gas.

Drop Stamping.

In the past the majority of drop stampers have been content so long as the furnace gave high output. Not infrequently this output was obtained by working the furnace at temperatures far in excess of the hammer's requirement to give a satisfactory stamping; this invariably results in burnt work and stampings whose performance do not in any way correspond with the characteristics of the steel used. Gas has therefore met the requirements of drop stamping since the rate of fuel consumption is in proportion to furnace output; it also offers less scale trouble than any other form of fuel. It is not possible to eliminate scale altogether at drop stamping temperatures. It is possible, however, to control the nature of the scale formed. A gas furnace operating at 1,250° C. to 1,275° C. having a furnace atmosphere containing 0·25 to 0·5% of free O_2 will create a very light, brittle scale on the heated piece; scale of this nature will, however, immediately fly off when the piece is placed on the die or has compressed air directed upon it. After much practical experience on drop stamping furnaces I am satisfied that this light, easily removed scale is preferable to an attempt to create a reducing atmosphere and claiming for it that such an atmosphere can cure all scale trouble. Although with a reducing atmosphere the scale may appear to be less, yet it is still present and, being of an adhesive nature, is not easily removed and is the cause of much trouble.

Punching and Drawing of Steel Ingots.

Furnaces taking charges of 22 tons are not frequently found, and it is therefore proposed to terminate this Paper with a brief description of three such furnaces just completed. Two of the furnaces are used for the punching and subsequent drawing of solid steel ingots 22½ in. in diameter by 5 ft. long, six or eight of these ingots being charged at once; the third furnace is used for the heat treatment of the tubes and vessels after their final draw. Each furnace is 23 ft. long by 4 ft. 3 in. high by 10 ft. back to front and is fitted with 15 Selas high-pressure gas burners operating at pressures up to 5 lb. per sq.in. The flue system has been arranged to give full control of underhearth heating, there being no less than eight front to back and seven back to front below-hearth flues, each flue having an individual check slide. The below-hearth flues join the main flues in such a manner that by the manipulation of the two main dampers it is possible to draw the heat to the front or back of the furnace at will quite independently of any previous adjustment on the below-hearth arrangements.

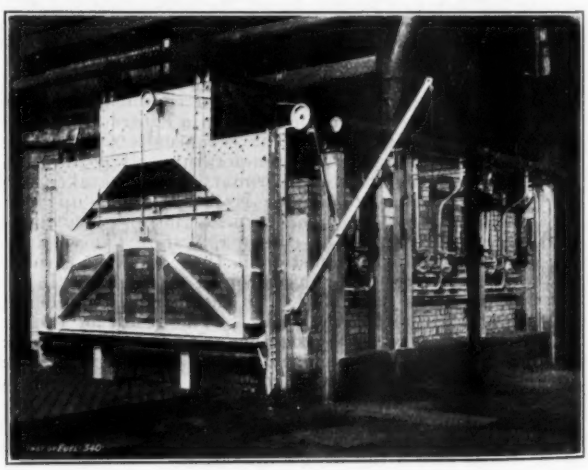
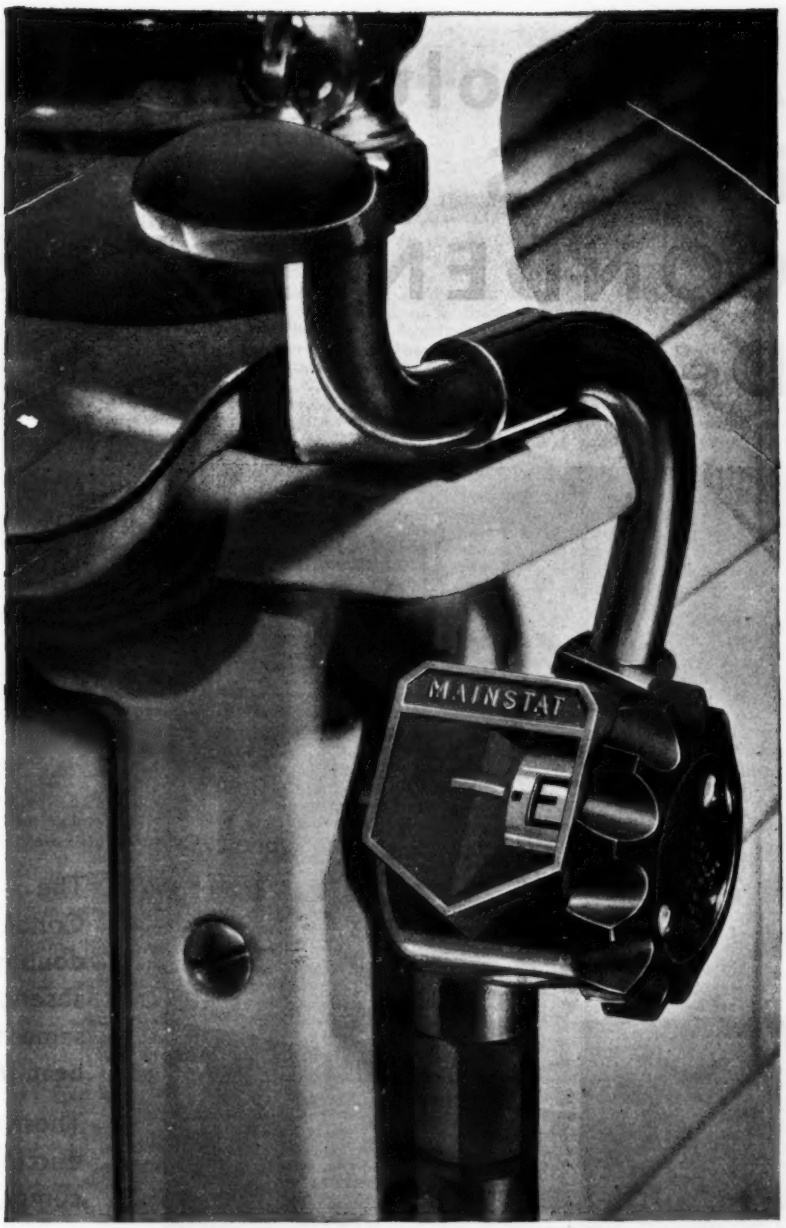


Fig. 9.—Gas-fired furnace for flanging and annealing locomotive and marine boiler parts. Previously fired by producer gas, this furnace now reaches 1,000° C. in 2½ hours from cold.

The following is indicative of the performance of the two high-temperature furnaces:

Furnace chamber dimensions	23 ft. 2 in. by 10 ft. 6 in. by 4 ft. 3 in. high.
Furnace temperature when load charged	540° C.
Load temperature when charged	Cold.
Load temperature when withdrawn	1,125° C.
Load temperature rise (approx.)	1,105° C.
Weight of load charged	16 tons.
Total gas consumed	110,710 cu.ft.
No. of cu.ft. per lb. of charge	3·08 cu.ft.
Total time of operation	6 0 a.m. to 2.10 p.m.—8 hr. 10 min.

Upon drawing work requiring a temperature rise of 700° C. to 1,050° C. this furnace is handling 78 tons of material every 37½ hours with a gas consumption of 1·8 cu.ft. per lb. of throughput.



★

The MAINSTAT, the front-view oven control with the distinctive red dial, has done much to minimise the attention required for cooking. Its construction, as with all MAIN products, is strong and durable, while its design is neat and attractive.

Mainstat control for the widest range of gas cookers

Automatic Control on cookers differing in design as widely as the Sussex, Super Mainservor, Deluxe Mainamel, etc., gives gas undertakings a unique advantage in that they are in a position to select from a variety of gas cookers fitted with Automatic Oven Control; a variety not only in price, but in size, design and finish.

Literature for any of the above mentioned cookers available upon request.

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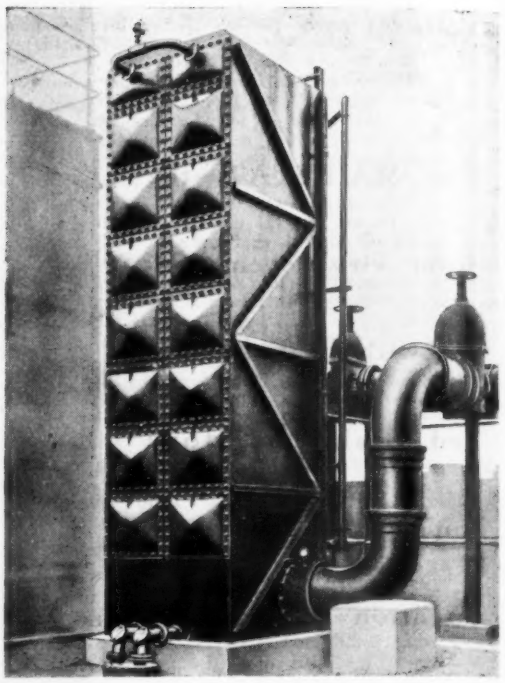
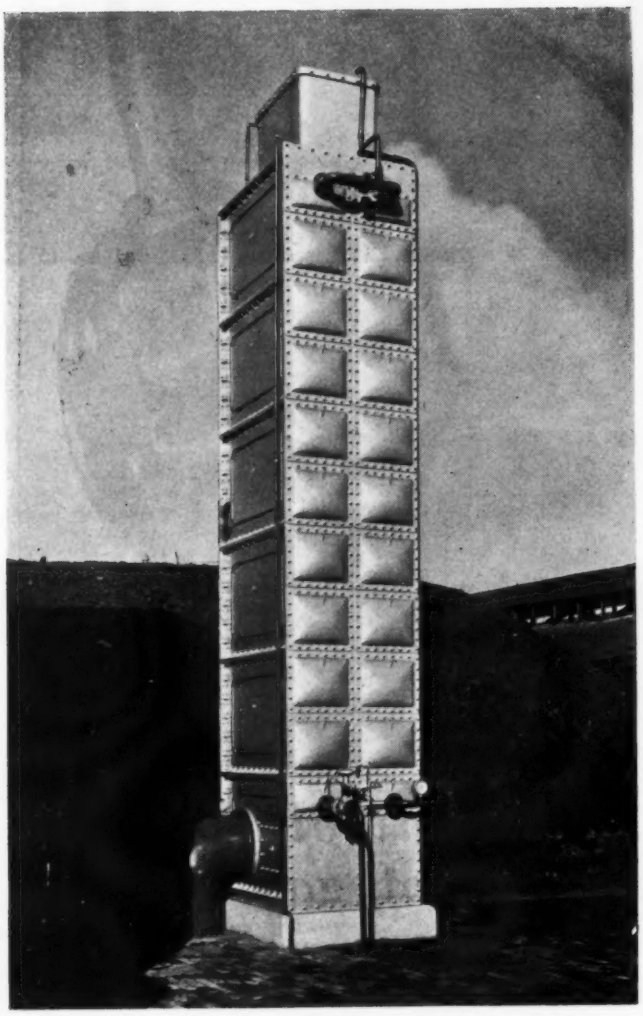


1½ million cubic feet per diem Condenser installed by us at the East Hull Gas Works.



3 million cubic feet per diem Condenser, designed, manufactured and erected by us for the West Bromwich Gas Department.

The Thorncliffe Horizontal Tube Condenser incorporates the patent double gas deflector plates ensuring absence of slip and dead space, at the same time rendering the transfer of heat from adjacent passes impossible.

These features give a definite reduction in water consumption as compared with previous types.

The incorporation of automatic temperature control maintains a constant gas outlet temperature.

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Annual General Meeting

The Ordinary General Meeting was held at the Company's office, Finsbury House, Blomfield Street, London, on Thursday, Nov. 21. Mr. B. W. ELLIS was in the Chair in the absence, through illness, of the Chairman, Mr. Stanley H. Jones.

The SECRETARY (Mr. S. Rainer) read the Notice convening the Meeting and also the Auditors' Report.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN, before moving the adoption of the Report and Accounts, said: It is with much regret that I find myself called upon to take the place of our Chairman, Mr. Stanley Jones, who, as many of you know, has been ill for some time past. I am glad to say that his progress towards recovery, though slow, is decided, and we hope at no remote date to have him back among us where he has been greatly missed.

Before reviewing the Accounts for the past year in detail, the chief point which emerges is the increase in sale of gas of over 1½%; and this, in view of the reduction in price to the Municipality of Calcutta in February, 1932, and to the private consumers in March, 1933, justifies the policy of cheap gas so emphasized by our Chairman and his predecessors. As those of you who were here last year will recollect he indicated his belief in the recovery in output, and this has not only been reached, but passed.

And now turning to the accounts, the capital account remains unchanged. In the revenue account, manufacture of gas is lower by £89. One of the chief items of decrease is coal, which is £575 less owing to lower rates prevailing during part of the year and to a less amount being carbonized; this, however, is coupled with a higher yield per ton. Salaries of officers are up by £626 owing to increases under agreements and a longer period of service with us by Mr. Gladstone who divides his time between the Bombay Gas Company and ourselves, and I may say that the liaison established between the two Companies in respect of employment and information works to our mutual advantage.

Carbonizing wages are up £95 and purification down £42. Repairs and maintenance of plant are less by £192. Under distribution of gas, here again salaries and wages of officers are up by £201 due to Agreement increment. Mains and services are lower by £1,885 owing to less activity in this direction. Repairs and renewals of meters are up by £348. Fittings and stoves are up by £1,593. Here we have smaller sales to look back on owing to the stagnation in the domestic load which has not lifted, although I may say geysers show a better result than cookers. We are also faced, like the home companies, with the gradual supersession of the old black stoves which we are dealing with. The net increase in distribution charges is £255.

The expenditure on public lamps is £8 down. We have 93 lamps added to the public lighting during the year. Rents, rates, and taxes are up by £290 by reason of increases in Indian taxation. Management, directors, and auditors are up by £184 and Secretary and Staff are up by £88 due to income-tax. Clerical salaries, Calcutta, are down by £638 due to change in staff and new appointments at lower commencing salary. Stationery and printing are down by £196. General expenses are up £335. We have been called on by various Funds in Calcutta for support—namely, H.M. Jubilee Fund and the Medical College Hospital Centenary Fund, and, in common with the other public utility concerns, have willingly responded. Over all, management shows a decrease of £226. Bad debts are £148 up and law charges £8; superannuations and pensions are up by £867 owing to retirement of officers; insurance is down by £35; expenditure, over all, is up by £1,393.

Turning to the receipts side, gas rental is £1,974 higher, the sales showing, as you already know, 1½% increase. Meter and stove rentals show an increase of £218. Coming to residuals, coke and breeze are down by £140. We have sold more and have cleared our stocks but at lower prices. With regard to tar, the exact reverse has occurred—we are up by £1,059, having sold less but at a higher price, resulting in an increased stock on hand at the end of the year. I cannot hold out any very bright prospect for residuals in the current year, as we are subjected to severe competition with up-country production. Rents receivable are down by £24 and transfer fees up by £1 7s. 6d.

The resulting sum carried to net revenue shows an increase of £1,695 over last year's figure, being in all £26,235 16s. 10d.

Referring further to the net revenue account, we have again carried £10,000 of this to reserve fund. Bank interest is down by £63, but interest on investments is up by £261 as we made substantial additions to our invested securities during the year. Exchange is up £251 owing to slight improvement in the average rate ruling for the Rupee and to higher remittances. The final result is a balance of £108,074 14s. 4d., or some £47 higher than the previous year. The special reserve accounts remain unaltered.

The Balance-Sheet.

Now with regard to the balance-sheet, besides the addition of £10,000 to the reserve fund, the most noticeable item is the addition of £19,969 to the amount invested, and although a reduction of £9,553 is shown in our cash balance, there is a net improvement in these two liquid assets of £10,416. The value of stores and amounts due to and by the Company show little change.

I think you will agree that the report justifies us in voting for the declaration of a final dividend of 4½% free of tax, making 8% free of tax for the year.

The condition of the works and plant has been kept up to its high standard as Mr. Garsed, our late Manager (here with us to-day), can assure you, and extensions in mainlaying have been carried out amounting to about 6,000 yds. As the improvement in our position is due to our industrial load, and, Calcutta being flat, we have sought to improve our pressure in the developing quarter by installing a booster in the south of the city. This has been done and is amply justified by results. You will have been interested to learn from the report that 708 new appliances have been sold or installed during the year. For this much credit is due to our staff, who have kept up their previous record in this respect. Our unaccounted for gas has dropped from 11·33% to 10·44%, and this with our long mileage of mains is excellent. The additions to mains have been almost entirely in the southern district where the industrial development is taking place, and we are glad to have Mr. Garsed with us for consultation for future planning.

Reverting for a moment to the revenue account, you will be interested to know that on the expenditure side under manufacture and distribution £3,748 is on capital account for cost of land, new booster, and mains, but has been charged to revenue following the practice of the Company for years past. To borrow a homely simile from agriculture, instead of harvesting the entire crop we annually plough back a proportion thereby increasing the fertility of the concern.

There being no questions by shareholders, the CHAIRMAN moved: That the Report of the Directors and the Statement of Accounts now submitted be received and adopted.

This was seconded by Mr. H. H. MCLEOD and carried unanimously.

The CHAIRMAN then moved: That a final dividend of 4½% free of income-tax be declared, making 8% free of income-tax for the year ended June 30, 1935, and that the warrants for the same be sent by post to the proprietors on Nov. 21.

Mr. W. G. BRADSHAW seconded the resolution, which was carried unanimously.

The CHAIRMAN said he now had to propose the re-election of Mr. Stanley Hunter Jones to his seat. That was the only vacancy which occurred this year. As so many of them knew Mr. Jones it was quite unnecessary for him—it would be almost impertinent of him—to commend him to them. He would just remind them that he had been a Director of this Company for 25 years and during the last ten years he had served as their Chairman. He had been unremitting in his attention to his work and, until quite recently, in his attendance there. He had not spared himself in their interests and therefore he had the greatest confidence and pleasure in asking them to re-elect him.

Mr. B. M. GILL seconded this resolution, which was carried unanimously.

On the motion of Mr. R. H. GLEN, seconded by Mr. E. C. FACHE, the Auditors, Messrs. S. W. Savage and F. J. Bradfield, were re-elected at the same remuneration as last year.

Vote of Thanks.

Mr. B. M. GILL, proposing a vote of thanks to the staff in Calcutta and in London for their services during the past year, said the Company had just lost the services of Mr. Garsed and Mr. Morrison by retirement. Mr. Garsed, who was present, had been with the Company for sixteen years, and during the last six years he had been Manager. He had done excellent work and the Company was extremely sorry to lose him. Mr. Morrison had been twenty years with the Company and during the last ten years he had been the Company's Fitting Superintendent, in which position he was a very difficult man to replace. They all wished Mr. Garsed and Mr. Morrison good health and happiness in their retirement. Mr. Savage had been appointed General Manager in place of Mr. Garsed. He had had sixteen years' experience, and the Board had no doubt of his ability to make a great success of his position. He would have an able Assistant in Mr. Gladstone. Just recently the Board had appointed Mr. Lyle as Junior Assistant Manager, and he had just arrived in Calcutta. The Board was also grateful to the other members of the staff in Calcutta for the work they did in their various departments, and it was fully realized by the Board and the proprietors that it was work of the kind done by the various members of the staff which made the Company the success it was. Finally, thanks were due to Mr. Rainer—in whom they had an ideal Secretary—and his staff in London.

Mr. H. H. MCLEOD seconded the vote of thanks, which was passed unanimously.

Mr. GARSED, acknowledging the vote of thanks on behalf of the staff in Calcutta, said these little messages coming from the Annual Meeting of the Company were a real stimulus to the

staff in India. They were to himself, and he knew he could say they were to the other members of the staff. It was a pleasure to the staff to carry out their duties, and they were all doing their best because they knew they were soundly backed up and supported and encouraged by the people at home.

Mr. RAINER also expressed appreciation of the vote of thanks on behalf of the London staff, which, although a small one, worked harmoniously together and he hoped efficiently and to the satisfaction of the Board.

Mr. F. J. BRADFIELD, proposing a vote of thanks to the Chairman and Board of Directors for their services during the past year, expressed the hope that they would again have the services of the Chairman long before the next Annual Meeting. He also drew attention to the manner in which progress was being made by the Company. The capital cost per 1,000 cu.ft. was getting less and less, and the items of expenditure and the amounts placed to the reserve fund also showed improvement year by year. In these circumstances, he suggested that they could look forward with confidence to the future.

Mr. R. H. GLEN, seconding the vote of thanks, said he had had an opportunity of visiting the works in Calcutta and seeing the work the staff there was doing. From what he had seen he was satisfied that the present Manager, Mr. Savage, would not let down the work done by Mr. Garsed.

The vote of thanks was carried unanimously, and the Meeting closed.

EXHIBITS OF INTEREST AT THE
Public Works, Roads, and Transport Exhibition

An account of some of the exhibits of direct or indirect interest to the Gas Industry at the Public Works, Roads, and Transport Exhibition which was held at the Royal Agricultural Hall, London, from Nov. 18 to 23. Reference to the Gas Industry Session, held in conjunction with the Exhibition on Nov. 19, is made on other pages of this issue.

The Public Works, Roads, and Transport Exhibition is the only one of its kind entirely devoted to the interests of surveyors, road engineers, architects, builders, civil engineers, contractors, and many other businesses supplying the needs of the various administrative departments of local authorities, and it is also the only exhibition which receives the official support of all the principal associations of local authorities and their officers.

The exhibits included all classes of machinery, plant, and materials used in connection with every phase of municipal enterprise, and it was therefore not unnatural that there were among the exhibitors a number of firms whose products are known and used in the Gas Industry. Below is a brief account of some of the principal exhibits seen on the stands of these firms.

The exhibit of the British Thomson Houston Company, Ltd., consisted mainly of a representative range of B.T.H. lighting equipment, including street lighting and floodlighting units.

The Chaseside Engineering Company showed examples of their "Hi-Lift" mobile power shovel—as used on many gas-works—a powerful shunting tractor, and a 1-ton crane jib attachment, together with various types of scoops. The features of the "Hi-Lift" are well known, and it is only necessary to say that models capable of dealing with 5 to 40 tons per hour are available either on solid or pneumatic tyres and with scoops to suit the type of product handled. A special feature of this stand was the Chaseside dumper of 2 cu.yd. capacity.

The stand of the Clay Cross Company, Ltd., comprised a comprehensive display of the firm's numerous activities, including centrifugally spun iron pipes, concrete lined pipes, vertically cast iron pipes, special castings manufactured in accordance with the B.S. Specification, suitable for use with both spun and cast straight pipe; road making materials, concrete products, pig iron, fuel economizers, building brick, including panels of rustic brick, gas coal, and furnace coke and coke nuts.

George Cohen, Sons, & Co., Ltd., showed a range of machines such as power picks and drills with various tools and attachments; also the Pegson power rammer and a portable emulsion sprayer for spraying cold emulsion, driven by a 2 h.p. Lister engine and special gear pump.

"Expamet" expanded steel in various meshes and weights for all forms of reinforced concrete and fire-resistant construction were shown by the Expanded Metal Company, Ltd., who were also displaying their steel for plaster work—particularly where bearers are too far apart for plain sheet lathing—and for reinforcement of brickwork. Examples of "Expamet" for fencing were also shown.

A range of screens and component parts of belt conveyors formed the exhibit of Fraser and Chalmers Engineering Works, including their "Gyrex" double and single deck screens, portable conveyors, and an electromagnetic vibrating screen.

Lighting Fittings.

Hailwood & Ackroyd, Ltd., exhibited ranges of their glassware for all types of street lighting fittings, for use with both gas and electricity. These included robots with the firm's patent part-time flicker lights, illuminated street island posts, destination and warning signs, together with ornamental and architectural fittings, shades, bowls, and globes of all descriptions.

An interesting display by the Horstmann Gear Company, Ltd., included automatic lighting devices for the control of public gas lamps. It was emphasized by the firm that automatic clock control effects an annual saving of 12s. to 20s. as compared with the cost of manual lighting and extinguishing. A full range of gas controllers was shown, including a new development in connection with clock controllers which entirely disposes of the usual by-pass save for about two seconds per day. In addition, the well-known "Newbridge" gas switch for the distance control of domestic lights, as well as for gas fires, was also demonstrated. A full range of electrical time switches was shown.

Lead wool for pipe jointing, showing the material in skeins ready for caulking, was the principal exhibit of the Lead Wool Company, Ltd. In addition to various types of lead wool, yarn, and other joints for gas mains, the firm were showing portable air compressors and joint testing apparatus for mains of 36 in. diameter and upwards. This tester enables each joint on a pipe line to be tested individually without filling the main, only a few gallons of water being required. This firm were also showing a full range of hand and pneumatic tools for mainlaying and contracting work generally, including concrete breakers, rock drills, clay diggers, caulking and chipping hammers, rammers, picks, &c.

Screens.

Among the exhibits on the stand of Pegson, Ltd., was their open de-breezing screen, which is equipped with roller bearings with special labyrinth dust seals, being all steel geared and noiseless in operation. Also shown was their "Telsmith" heavy duty screen and roller-bearing granulator; the Pegson counter current concrete mixer, together with a magneto-operated power rammer, which is simple to operate and requires little attention.

A literally brilliant display of gas street lighting equipment was to be seen on the stand of W. Parkinson & Co. Many of their well-known lamps were exhibited with different types of reflector and suspension. The upward beam alignment floodlight lamp shown was typical of nearly a thousand such fittings supplied for Jubilee Celebrations to over 50 towns in the British Isles. A range of "Mor-lite" reflectors and preheated burners was also displayed, together with the firm's clock controllers for automatic lighting and extinguishing of street lamps. Various charts for the simplification of street lighting calculations, prepared by the firm's Gas Lighting Research Bureau embodied the

latest methods for the determination of horizontal illumination and the preparation of iso-lux diagrams.

Reavell & Co., Ltd., showed a selection of air compressors and exhausters, both portable and stationary machines. There was a Diesel engine driven set, a petrol engine set, and a range of stationary single acting vertical compressors suitable for pressures up to 100 lb./sq.in. A number of rotary compressors of various types were also shown, as well as specimens of the latest model of the firm's " John Bull " concrete breaker.

Pipes for the Gas Industry.

An attractive display by the Staveley Coal and Iron Company, Ltd., showed examples of their sand-spun cast-iron pipes of various diameters and specials and flexible joints. Also exhibited was a selection of their coal, pig iron, chemicals, and by-products, as well as tarred and dry slag.

The Kennedy ball-bearing gearless gyratory crusher was shown on the stand of the Sheepbridge Coal and Iron Company, Ltd. The Kennedy vibrating screen was also shown, a feature of this apparatus being that the beams supporting the screen bearings are of sufficient strength to eliminate vibration in the screen supports. Instead, the vibration is in the screen side frames and screens from one end to the other. This type of vibration makes it possible to use lower speeds for large pieces and higher speeds for small pieces, while it continually turns over the material when passing over the screen surface. Also exhibited on this stand was an air-swept tube mill for pulverizing all classes of material, including coal, limestone, and various rocks.

Displayed by Thomas & Bishop, Ltd., were examples of their well-known " Flexo " belt dressing and tinning compound, together with asbestos furnace cement and " Permac " metal-to-metal jointing material. Their " Kester " solder, also shown, is claimed to provide all the advantages of the solder and flux in one.

An interesting display of asbestos-cement pressure pipes was exhibited by Turner's Asbestos Cement Company, these pipes being stated to provide absolute immunity from corrosion, incrustation, and electrolytic action. The chief feature of note this year were two developments which will appeal to Engineers—namely, an all asbestos-cement flexible screw joint, to eliminate still further the use of metal in a pipeline and particularly to eliminate the use of bolts in flexible joints. The second new development of particular interest was asbestos-cement pipes of 1½ in. diameter. Previously 2 in. was the minimum diameter in which these pipes were made, but it is now possible to obtain them in this smaller size.

These new developments were to be seen on the stand, together with an exhibition of " Everite " asbestos-cement pressure pipes and appurtenant fittings.

Midland Juniors Visit Stove Works

Guests of the Parkinson Stove Company

Over a hundred members of the Mid and Junior Gas Association assembled at the Stechford Works of the Parkinson Stove Company on Nov. 21 to enjoy what proved to be an extremely interesting and instructive visit. This was the fourth occasion on which the Association has visited the Works of the Company during the last twenty-five years—a great testimony to the hospitality of the Company and the perennial popularity of the Works.

To the number of over one hundred, members of the Midland Junior Gas Association assembled at the Stechford Works of the Parkinson Stove Company, Ltd., on Nov. 21 to enjoy what proved to be an extremely interesting and instructive visit. This was the fourth occasion on which the Association has visited the Works of the Company during the last twenty-five years. Surely this is a great testimony to the hospitality of the Company and the perennial popularity of the Works.

The Works are approximately five miles from the centre of Birmingham, adjacent to the Stechford Station on the main line of the London, Midland, and Scottish Railway from Birmingham to London. Covering an area of 18 acres and having ample room for future extensions, these Works give employment to approximately 1,500 people. The factory is busily engaged in the manufacture of all types of domestic gas cooking and heating appliances, including cookers, fires, radiators, and water heaters. The various processes in the manufacture of gas appliances from the pig iron to the finished article packed and ready for delivery were inspected by the members; and here a word of praise is due to the guides for the admirable way in which they explained these processes to the complete satisfaction of all. Up-to-date factory methods have been studied by the Company, with the result that from the earliest stages in the drawing office until the completed appliance reaches the testing laboratories, the many various operations follow one another smoothly and naturally. This planning makes for economy and efficiency, the benefits of which are passed on to the gas undertakings.

Any projected new appliance receives very careful attention with respect to design in the Company's well equipped drawing office. This important department is staffed by very competent designers with long experience of the different types of gas appliances. The next section comprises the laboratories, and these deserve special mention. Every item of raw material passing into the Works is tested in the chemical laboratory. The materials checked and analyzed in this way include the pig iron, the coke for the cupolas which provide the foundry with its molten metal, and the sand employed in the casting operations. The enamelling department also provides the chemical laboratory with a good deal of work, for the raw materials as well as the prepared enamels are submitted to the strictest examination and investigation. Microscopic and microphotographic investigations are also conducted on the foundry materials.

Other equipment in the laboratory includes apparatus for the testing of the radiant efficiency of gas fires, flue gas testing, and testing for satisfactory combustion. As far as cookers are concerned, cooking tests are carried out by the company's own qualified cookery demonstrators. From the laboratory point of view, complete tests are conducted for temperature distribution, flue gases, the heat requirements of the oven, and the question of heat losses. Water heaters are tested for efficiency, maintenance, flue gas tests, and tests for overload.

The laboratories are provided with high-pressure air and high-pressure gas for testing purposes, and appliances may be tested at any suitable pressure. All the pressures are correctly governed and are regulated to meet the varying conditions of all the gas undertakings in the British Isles. This excellent policy ensures that the consumer will be absolutely satisfied with the appliance the gas undertaking

has supplied. This, of course, benefits the undertaking with lower maintenance charges.

After the drawing office and experimental work has been accomplished, the next stage is carried out in the pattern shop. Plaster "strickles" are first made, and after these have been subjected to any modification required, a lead pattern is made; the final process is the making of the plate pattern. All patterns are carefully indexed for record and suitably stored.

From the pattern shop the members proceed to the foundry, which is one of the largest of its type in the Midlands. The molten metal when first tapped from the cupolas is poured into large ladles, which are carried by means of overhead conveyors to the moulders' "sides." From the large container the metal is then poured into small ladles and so into the prepared moulds. After the castings have cooled they are transferred to the dressing shop, and extreme care is taken in the inspection at this stage to ensure that none but perfect castings are passed.

Adjacent to the foundry is the core and burner shop where all burner parts and similar components are made. In the blacking shop paint is sprayed on to the castings and then stoved. The visitors were very interested in the belt conveyor stoving chamber provided for this purpose.

The Enamelling Department.

The trend of fashion in recent years has resulted in an ever increasing demand for brighter appliances. This demand has been successfully met by the Parkinson Stove Company, and, as a consequence, the enamelling department now ranks among the most important sections of the Works. The Company manufactures a large proportion of the enamelling frit used, employing rotary melting plant for this purpose. Each melter deals with about 600 lbs. of frit at a time. In the wet cast enamel section the parts which are to be enamelled are first annealed and sand-blasted in order to ensure an absolutely clean surface. The enamel is then sprayed on, and, after drying, fused in a muffle furnace.

The sheet enamel department deals with door panels, side panels, and similar articles. The pressed steel parts are cleaned by means of a trichlorethylene degreaser and acid dips, and are subsequently dried off by passing through a steam-heated conveyor. In this instance the enamel is either swilled or sprayed on and then fused as in the wet cast enamel section. Some idea of the enormous stocks it is necessary to maintain to meet the demands for the large variety of appliances manufactured at the Works was gained from the stores. This department, as is the case elsewhere at Stechford, is a model one from the point of view of orderliness.

In the fitting and assembly shops the visitors saw the various appliances beginning to take shape. On completion of assembly the cookers and other appliances pass on to the test bench and finally, after a rigorous examination, on to the warehouse prior to despatch. At this point it is convenient to deal with the press shop and tool room, which again ever-changing fashion has increased in importance in recent years. The plant in this section comprises small fly type presses up to large power presses of over 150 tons. Here all sheet metal components are prepared, such as cooker sides, grill, and drip tins.

Another important department in the Works is the plating shop engaged in nickel and chromium plating. Much of the work in this section concerns the finishing of geyser parts, and the plating department has had to be enlarged twice within the past few years. The geyser department is housed in a separate building and is fully equipped for the manufacture of the most modern type of gas-heated water heaters.

A tour of the Works would not be complete without reference to the research kitchen. Here all new cookers are thoroughly tested from the consumer's point of view before being put into production, and, at the same time, continuous check tests are carried out on appliances already being manufactured.

W. Parkinson & Co.

Housed on the same site is the factory of Messrs. W. Parkinson & Co., manufacturers of gas meters and all forms of public lighting equipment, including square, suspension, and U-fixing lamps, as well as floodlighting apparatus. This Company maintains a Gas Lighting Research Bureau which, in recent years, has carried out valuable research work on public lighting problems with a view to assisting gas engineers to retain the street lighting load against electric competition.

A group of Members at the Stechford Works.

Vote of Thanks.

The visitors were entertained at high tea by courtesy of the Directors of the Parkinson Stove Company when every member was presented with a souvenir of the occasion.

Welcoming the Association, Lt.-Col. H. W. Woodall, Chairman, said that what the visitors had seen that day was all due to the excellent work of Mr. R. J. Rogers, their Managing Director.

A vote of thanks was proposed by Mr. F. L. Atkin, President of the Midland Juniors, who added that anything he could say was small recompense for the delightful visit to the Works, where everything spoke of efficient organization. It was a unique occasion, for it was the first time that they had had the pleasure of seeing one of their past-Presidents at work! He was referring to Mr. Rogers, whom it was particularly pleasing to meet again, and he was sure that all present would join him in wishing Mr. Rogers all success in the future. The vote was ably seconded by Mr. B. Green, Stourbridge.

In response, Mr. R. J. Rogers said it was a very rare pleasure to have met again so many old colleagues and fellow members. He went on to refer to the necessity for the closest collaboration between the manufacturer and gas undertakings. That collaboration had led to the good position that the Industry found itself in to-day in being able to hand over to the public the finest appliances. He paid high tribute to assistance he had received from the staff, who worked as a team for the welfare of the Company. Mr. W. Todd briefly responded on behalf of the staff.

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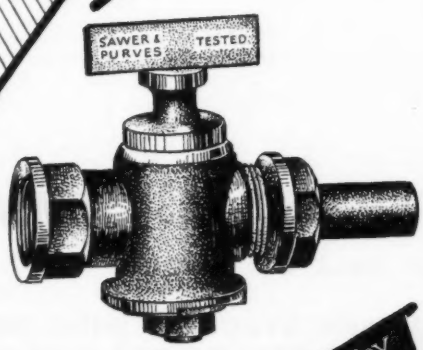

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By Order of the Directors. New Issue of Ordinary Stock.

THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY

(Established 1845. Incorporated 1847. Re-incorporated 1866.)

DIRECTORS.

FRANCIS J. DICKENS, Esq., J.P., The Hill House, Silverdale, Lancashire (Chairman).
JOSEPH X. MURPHY, Esq., 17, Eden Quay, Dublin (Deputy Chairman).
FRANCIS CALVERT BUTLER, Esq., Dale House, Carnforth, Lancashire.
RT. HON. JAMES MacMAHON, P.C., St. John's, Islandbridge, Dublin.
JOHN McCANN, Esq., 29, Anglesea Street, Dublin.
SIR RICHARD A. NEEDHAM, Queen Anne's Mansions, St. James's Park, London, S.W. 1.
HAROLD ROGERS, Esq., Inglewood, Silverdale, Lancashire.
FRANCIS W. SWAINE COPE, Esq., Greenside, Three Gates Lane, Haslemere, Surrey.

STOCKHOLDERS' AUDITORS.

WILLIAM CASH, Junr., Esq., M.A., F.C.A.
ALDERMAN DR. MYLES KEOGH.

OFFICIAL AUDITORS APPOINTED BY THE MINISTRY FOR INDUSTRY AND COMMERCE.

Messrs. KEAN & Co. (Chartered Accountants).

SOLICITORS.

Messrs. D. & T. FITZGERALD.

GENERAL MANAGER AND SECRETARY.

WILLIAM JAMES GREY, A.C.A.

HEAD OFFICE.

21a, D'OLIER STREET, DUBLIN, C. 5.

BANKERS.

HIBERNIAN BANK LIMITED, College Green, DUBLIN, C. 1.
DISTRICT BANK LIMITED, 75, Cornhill, London, E.C. 3.

BROKERS.

M. DILLON & SON, 3, Trinity Street, Dublin.
PEMBER & BOYLE, 6, Princes Street, Bank, and Stock Exchange, London, E.C. 2.

THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY

PARTICULARS AND CONDITIONS OF SALE BY TENDER

OF

SUCH AN AMOUNT OF CONSOLIDATED ORDINARY STOCK AS WITH THE PREMIUMS OBTAINED ON THE SALE THEREOF WILL REALISE THE SUM OF

£300,000

being Additional Capital Stock proposed to be issued in exercise of powers reserved to the Company under the Alliance and Dublin Gas Act, 1909, Section 17, and under the authority of a resolution passed at an Extraordinary General Meeting of the Company held on the 28th day of March, 1935.

The Directors of the above Company give notice that they will be prepared to receive tenders, subject to the conditions hereinafter contained, for the above amount of Consolidated Ordinary Stock of the Company, to be paid up in full on or before the 1st January, 1936, the dividend thereon to commence to accrue from the said 1st January, 1936.

The stock so offered will rank for the Standard Dividend, subject to the Sliding Scale, equally with the existing Consolidated Ordinary Stock on which, for the last nine years, including the half-year ending 30th June last, a Dividend at not less than a rate of seven per cent. per annum has been paid.

At this rate the approximate yield per cent. on the purchase money is shown by the following table:—

On Consolidated Ordinary Stock receiving a Dividend of seven per cent., if tendered for at—

£13	10	0	per £10	or	£135	per £100 stock	the yield is	£5	3	6 per cent.
£13	12	0	,,		£136	,, ,,	,,	£5	2	11 ,,
£13	14	0	,,		£137	,, ,,	,,	£5	2	2 ,,
£13	16	0	,,		£138	,, ,,	,,	£5	1	5 ,,
£13	18	0	,,		£139	,, ,,	,,	£5	0	9 ,,
£14	0	0	,,		£140	,, ,,	,,	£5	0	0 ,,
£14	2	0	,,		£141	,, ,,	,,	£4	19	3 ,,
£14	4	0	,,		£142	,, ,,	,,	£4	18	7 ,,
£14	6	0	,,		£143	,, ,,	,,	£4	17	11 ,,
£14	8	0	,,		£144	,, ,,	,,	£4	17	3 ,,
£14	10	0	,,		£145	,, ,,	,,	£4	16	6 ,,

The lowest price quoted on the Dublin Stock Exchange during the six months ended on the date hereof for the Company's Consolidated Ordinary Stock was £13 12s. 6d. per £10 Stock or £136 5s. 0d. per £100 Stock; the highest during the same period was £14 9s. 4½d. per £10 Stock or £144 13s. 9d. per £100 Stock.

A deposit of £10 per £100 of the nominal amount of stock applied for must accompany each tender, otherwise the tender will not be accepted. The balance of the purchase money is to be paid as follows:—£50 per £100 of Stock on or before the 18th December, 1935, and the remaining balance on or before the 1st January, 1936.

The Stock will rank for dividend as from 1st January, 1936, but no dividend shall be payable in respect of any Stock of which the full balance of the purchase money has not been paid.

The Stock now offered will be registered and the Certificates issued in the names of the allottees, or their nominees, free of expense.

Allottees will also derive the benefit of not less than approximately 2 per cent. in acquiring such Stock as may be allotted to them without the expenses usually incurred by purchase on the Stock Exchange in the ordinary way.

The Company having no power under its statutes to pay underwriting commission or brokerage, none has or will be paid.

The Net Revenue of the Company, after providing for Income Tax, for the year ended 30th June last was	£136,262 0 6
The Interest on Debenture Stock amounted to	14,960 0 0
Leaving available for Dividend on the Consolidated Ordinary Stock	121,302 0 6
The Dividend on the Stock already issued absorbed	108,630 15 2
Leaving a Balance of	£12,671 5 4

If to this Balance is added the Interest on Overdraft which will be saved when the new Stock is issued and the profit from the investment of such portion of the proceeds of the issue as will be temporarily available for investment, the resulting Balance would thereupon more than suffice to pay a Dividend of 7 per cent. on the Stock now being issued.

After payment of Dividend for the half-year ended 30th June last, there remained to be carried forward a Balance of Undivided Profit amounting to		£40,436 13 2
The accumulated funds of the Company on 30th June, 1935, were:—		
Reserve Fund	£108,368 1 2	
Renewal Fund Leasehold	6,807 10 10	
Special Purposes Fund	77,593 8 0	
Contingent Fund	1,436 2 6	
		194,205 2 6
		£234,641 15 8

The Funds are to a large extent invested. The Book Value of Investments at 30th June, 1935, was:—	
On Reserve Fund	£99,375 9 8
On Special Purposes Fund	71,742 14 8
On General Account	9,530 0 0
	£180,648 4 4

The market value, less accrued interest, of these investments on that date was approximately £211,000.

The Company or its predecessors has been manufacturing and supplying gas for 115 years. Its area of supply is the City of Dublin, the Borough of Dun Laoghaire (formerly Kingstown) and other portions of the County of Dublin and the Urban District of Bray, in the County of Wicklow.

The Company has not raised any additional capital for the past twenty-five years, although in the meantime the expenditure, less credits, on Capital Account has been approximately £502,000.

The Balance overspent on Capital Account at 30th June last was £290,619 6s. 6d. The Capital now being raised is required for the

THE ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY

purposes of liquidating this Balance and, consequentially, of extinguishing the Company's overdraft and leaving cash resources of approximately £100,000 out of which to meet the continuing expansion of the Company.

In 1922 the "therm" system was adopted as the basis of charging for gas sold by the Company. The following figures illustrate the growth in the Company's business since then:—

Year.	Therms Sold.	Price of Gas Per Therm.	Net Profit after Providing for Interest on Debenture Stock.	Rate of Dividend Per Annum.
			£ s. d.	£ s. d.
1922	6,587,683	1/6	98,201 7 9	5 0 0
1923	6,772,178	1/5 & 1/3	103,853 15 11	5 15 0
1924	6,851,484	1/1	106,425 9 8	6 5 0
1925	7,528,562	1/1	109,065 9 1	6 5 0
1926	8,598,519	1/1 & 11.8d.	90,830 3 5	6 12 6
1927	9,379,865	11.8d.	131,855 19 9	7 0 0
1928	9,624,131	10.8d.	119,776 6 5	7 12 6
1929	10,208,411	,,	119,323 15 8	7 12 6
1930	10,651,756	,,	122,736 14 9	7 12 6
1931	11,064,429	,,	121,391 14 5	7 12 6
1932	11,351,632	,,	105,822 11 4	7 6 3
1933	11,549,193	,,	108,400 6 2	7 0 0
1934	12,055,147	,,	112,724 12 7	7 0 0
Half year ended 30th June, 1935	6,272,999	10.8d.	62,023 1 10	7 0 0

In consequence of the imposition of Duties and new Taxes the Dividend was reduced from the rate paid for the 4½ years ended 30th June, 1932, to the present rate, which has since been maintained.

The Sliding Scale applies to the Company, the Standard Price of Gas, as fixed by the Minister for Industry and Commerce under an order dated 1st January, 1925, being fifteen pence per therm. The Standard Dividend of 5 per cent. on the Consolidated Ordinary Stock may be increased by 2s. 6d. per cent. per annum for every one-fifth of a penny per therm reduction in the price charged for Gas below fifteen pence and must be reduced in the same ratio for every increase above fifteen pence.

The present selling price is 10·8d. per therm.

The Order of the Minister for Industry and Commerce is subject to revision in the circumstances prescribed by the Regulations under which it was issued.

	£	s.	d.	
The **Total Capital Stock** authorised under the Company's Acts, 1866 to 1909, is	1,851,868	0	0	(a)
of which there has been issued, Consolidated Ordinary Stock	1,551,868	0	0	(b)
Remaining to be issued, including premiums ...	300,000	0	0	

(a) and (b) include £696,248 added on Conversion.

Premiums amounting to £72,102 7s. 6d. have been received in respect of the Consolidated Ordinary Stock issued.

	£	s.	d.
The **Loan Capital** authorised under the Company's Acts of 1866, 1874, 1883, and 1909, is ...	474,000	0	0
of which there has been raised Debenture Stock 4 per cent. Perpetual	374,000	0	0
Remaining to be borrowed	100,000	0	0

Premiums amounting to £6,458 9s. 1d. have been received in respect of the total amount of Debenture Stock issued.

Every tender for the Stock must be for a nominal amount of £10 or more and in multiples of £1, and must be made on the accompanying form and reach the Company's Head Office not later than 11 o'clock a.m. on Wednesday, 4th December, 1935. Every tender must specify a rate per £100 Stock; tenders "at the minimum price" but not specifying a rate cannot be accepted.

The Stock will be allotted to the persons tendering the highest price or prices and in the event of the receipt of tenders sufficient with the premiums to realise more than £300,000, the tenders at the lowest price accepted will, as far as possible, be subject to a pro rata diminution. The minimum price at which Stock will be allotted is the reserve price which will be notified to the Minister for Industry and Commerce as laid down by the Alliance and Dublin Gas Act, 1909.

If no allotment is made the deposit will be returned in full. In case of partial allotment the balance of the deposit will be retained and applied towards payment of the balance of the purchase money, and the surplus, if any, will be returned.

Payment in full may be made at any time before the due date after allotment, but no discount will be allowed. Failure to pay the balance or any part of it on the due dates will render the allotment liable to cancellation and the deposit liable to forfeiture. Interest at ten per cent. per annum will be charged on balances or any part thereof not paid on the due dates (18th December, 1935, and 1st January, 1936).

The Stock allotted will be registered in the Company's books in the name of the person tendering, or his or her nominee, free of expense, and will be transferable by deed in the usual way as soon as it is fully paid, in amounts or multiples of £1. The minimum holding is, however, £10.

The Company's Consolidated Ordinary Stock is quoted at Dublin, Cork, London, Liverpool, and Manchester. Applications will be made in due course to the Committees of these Stock Exchanges to allow dealings in the Stock now being issued.

The Accounts of the Company are made up half-yearly to 30th June and 31st December, and are submitted to the Stockholders in September and March. Dividends are paid in October and April.

Further copies of this Prospectus may be obtained from the Company's Head Office or from the Hibernian Bank Limited and the District Bank Limited or any of their branches or from the brokers named herein.

By Order of the Board of Directors,

Head Office:
24a, D'Olier Street, Dublin, C.5.
24th October, 1935.

WILLIAM JAMES GREY, A.C.A.,
General Manager and Secretary.
Alliance and Dublin Consumers' Gas Company.

This Form to be detached and forwarded to the ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY in a sealed envelope marked "Tender for Stock," so as to be received by the Company not later than 11 o'clock a.m. on Wednesday, 4th December, 1935.

The minimum amount of Stock which may be tendered for, or will be allotted, is £10. Above this, tenders may be in amounts or multiples of £1.

The Stock will be registered in the Company's books and the certificates issued in the name of the allottee, or his or her nominee, free of all expense.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY

(a) State here the nominal amount of Stock tendered for.
(b) State here the amount per £100 at which the tender is made.
(c) Strike out the words not required.

I hereby tender for (a) £..... of the Consolidated Ordinary Stock of this Company, at the rate of (b) £ ..... per £100 Stock on the terms of the Prospectus dated 24th October, 1935, and agree to accept that amount of Stock, or any lesser amount that may be allotted to me. I enclose herewith (c) { Cheque / Postal or money Order / Cash } for £....., being £10 per cent. deposit of the nominal amount tendered for, and agree to pay to the Company on or before 18th December, 1935, £50 per cent. of the nominal amount of Stock allotted to me and to pay the balance of the purchase money to the Company on or before 1st January, 1936.

Full Name .....
(In block capitals.)

Address .....

Description .....
(If a Lady, please state whether Married, Widow, or Spinster.)

Signature .....

Date ....., 1935

To the Alliance and Dublin Consumers' Gas Company,
Head Office, 24a, D'Olier Street,
Dublin, C. 5.

Cheques for the deposit should be drawn to "Alliance and Dublin Consumers' Gas Company, or Bearer," and crossed "a/c Payee only." Not negotiable. **Any alteration from Order to Bearer must be signed by the Drawer.** If the deposit is remitted in any other form, the tender should be sent by registered post.

N.B.—No receipt will be issued in respect of the above payment, but an acknowledgment will be forwarded in due course, either by Letter of Allotment or return of deposit.

NOTICE in connection with the above-mentioned issue of Consolidated Ordinary Stock

For the convenience of intending applicants for the Stock in Northern England, it has been arranged that copies of the Prospectus above set out may also be obtained from the following Brokers:—

Messrs. W. A. ARNOLD & SONS,
Haworth's Buildings,
5, Cross Street,
MANCHESTER, 2.

Messrs. CRICHTON BROS. & TOWNLEY,
Queen Avenue,
13, Castle Street,
LIVERPOOL, 2.

24th October, 1935.

(Signed) WILLIAM JAMES GREY,
General Manager and Secretary.

STANTON
NEW SPUN IRON PIPE

Manufactured under Delavaud and Mairy Patents

Cast without chill in a metal mould and subsequently normalised by heat treatment.

The Strongest Iron Pipe Ever Produced

The Stanton Ironworks Company Limited, Near Nottingham

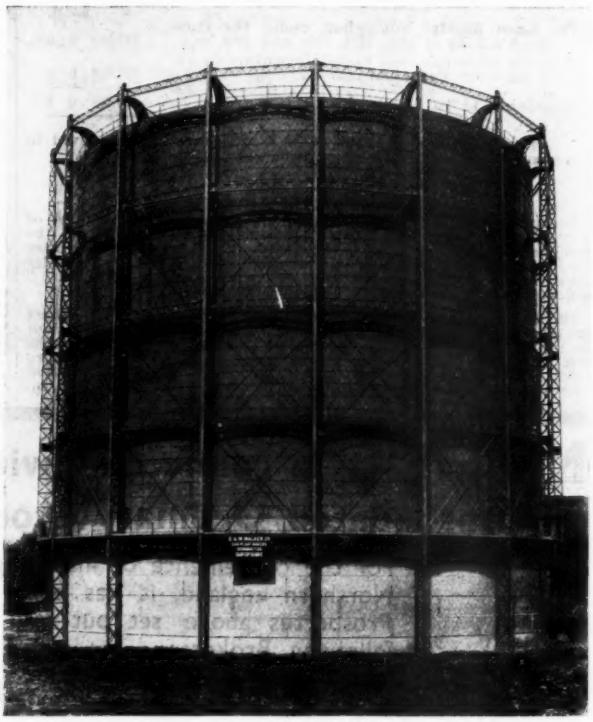
GUIDE-FRAMED GASHOLDERS

WITH OR WITHOUT
STEEL TANKS
HAVE BEEN MADE
FOR
70 YEARS
OF
BRITISH MATERIALS
BY
BRITISH LABOUR
WITH
HIGHEST QUALITY IN WORKMANSHIP
BY

C. & W. WALKER

LIMITED
DONNINGTON
Nr. WELLINGTON—
—SHROPSHIRE

'Phone: Lilleshall-Shropshire Nos. 34 & 35 (2 lines)
'Grams: "Fortress," Donnington, Shropshire



AT BELPER, Nr. DERBY
CAPACITY, 2 MILLION CUBIC FEET

LONDON OFFICE—70, VICTORIA STREET, WESTMINSTER, S.W.1

'Phone: Victoria No. 1941

'Grams: "Fortress," Sowest, London

The Gas Regulation Acts

Tottenham Company's Order

As reported in the "JOURNAL" at the time, the Tottenham and District Gas Company earlier in the year made an application to the Board of Trade under the Gas Regulation Acts for an Order authorizing an extension of its limits of supply into certain parts of Bedfordshire and Hertfordshire, and an enquiry was held in July. The Order proposed to include the district of Ampthill, powers to supply which had also been asked earlier in the year by the Luton Gas Company. At the time of the Tottenham enquiry it was agreed that Ampthill should be cut out of the Tottenham Order, but it was agreed, without going into details, that the Luton Company would give the Tottenham Company facilities for laying a through main in order to reach the adjacent areas which the Tottenham Company was seeking to supply. Owing to difficulties arising from the fact that the Tottenham Company has given the Bedfordshire County Council a protective clause and the Luton Company is asking for a clause in the Tottenham Order for protection in respect of the through main which the County Council believes will conflict with the protective clause it has obtained from the Tottenham Company, the Board of Trade held a further enquiry into the matter at the offices of the Board in London on Friday, Nov. 15.

At the conclusion of the enquiry into this special matter, an attempt was made by the Woburn Gas Company, the Biggleswade Urban and Rural District Councils, and a Mr. Flawn, a gas consumer in Hitchin, to induce the Director to re-open the enquiry into prices. This was strongly opposed by Mr. Jacques Abady, K.C., who appeared for the Tottenham District Gas Company, and contended that every opportunity had been given for the discussion of this matter at the enquiry in July, and that but for the consideration of the circumstances which had arisen concerning the protective clauses as regards roads and the laying of mains, the enquiry would not have been re-opened. Moreover, he pointed out that the Woburn Gas Company and the Biggleswade Urban and Rural District Councils were represented at the last enquiry and that the Hitchin Urban District Council, which represented the consumers of gas, had also been represented, and so far as this matter was concerned all the facts were before the Director.

After a brief consideration, the DIRECTOR decided that he could not re-open the question of charges as proposed in the Tottenham Draft Order.

The Circumstances of the Re-Opening.

Mr. JACQUES ABADY, K.C., for the Tottenham Company, said that all he proposed to do was to outline briefly the circumstances in which the enquiry had been re-opened. He explained how the Tottenham and Luton Companies had come to an agreement under which the Tottenham Company was to be allowed to lay what was known as a sealed main through the Ampthill district—which was to be supplied by the Luton Company under the terms of an Order already granted to it by the Board of Trade—and that the Tottenham Company was not to be allowed to supply any gas in that area without the consent of the Luton Company, the purpose of the through or sealed main being to enable the Tottenham Company to link up areas which surrounded the Ampthill district. There was agreement between the two companies to that effect in general terms at the time of the Tottenham enquiry in July, but it was not necessary for the matter to be pursued further at that time, and the Ampthill Rural area was excised from the proposed Tottenham draft Order so far as powers to supply were concerned.

Up to that point everything had been perfectly straightforward, but a certain difficulty had been introduced inasmuch as the Tottenham Company had come to an agreement with the Bedfordshire County Council with regard to protection for the County Council in connection with the laying or removal of mains under which certain notices were to be given, plans were to be provided and certain powers as to supervision, arbitration, &c., were given to the Bedfordshire County Council. The Tottenham Company having given a clause in these terms, of course had no intention of doing other than carrying out the arrangement thus arrived at, and a clause had been inserted in the Draft Order which had not yet been sanctioned by the Board of Trade. The Luton Gas Company had asked for a clause in more or less similar terms to be given to it, and inserted in the Tottenham Draft Order, with regard to the laying of the through main in the Ampthill district which was in the county of Bedfordshire, but the County Council objected to this on the ground that it might be involved in a dispute between the Luton and Tottenham Companies arising out of the application of such a clause, and, further, that the Luton Gas Company's officials would be given rights of supervision, &c., over the carrying out of any works similar to those which had been granted to the County Council. The question of arbitration was also involved, and the County Council did not contemplate with satisfaction a situation in which they might have to take part in an arbitration between the two companies or that there might have to be two arbitrations to determine the same issue.

These, said Mr. Abady, were the circumstances of the re-opening of the enquiry, but he did not feel it right that he should offer any arguments as to the merits of the proposals made by the Luton Gas Company. The Tottenham Gas Company offered no objection to the proposals of the Luton Gas Company, but at the same time it had to keep faith with the Bedfordshire County Council on the terms of the clause which had been offered to and accepted by the County Council. Therefore it was for the Director to say whether he thought the suggestions made by the Luton Gas Company conflicted with the protection which the Bedfordshire County Council had accepted from the Tottenham Company or deprived the County Council of any rights which had been agreed between the Tottenham Company and the County Council.

A Conflicting Proposal.

Mr. J. F. RONCA (Director of Gas Administration) said that at the moment his view was that the proposal of the Luton Company conflicted with the agreement previously come to by the Tottenham Company with the Bedfordshire County Council.

Mr. H. ROYSTON ASKEW, for the Luton Gas Company, asked whether he understood the Director to mean that the Luton proposed clause would not be granted.

The DIRECTOR said he would be in a difficulty if the matter was not going to be argued on both sides, and apparently it was not, as Mr. Abady had said he felt tied and could not argue, having already made the agreement with the Bedfordshire County Council.

Mr. H. ROYSTON ASKEW said he was in the position of bringing up a clause to be inserted in the Tottenham Order for the protection of the Luton Gas Company on the basis of the verbal agreement made before the Director at the time of the Tottenham enquiry last July. He understood that the Bedfordshire County Council was represented and no doubt would submit some obeservations on the matter.

Mr. A. V. WINSER (Messrs. Sherwood & Co., Parliamentary Agents) said that although he was present he had no occasion to intervene because the rights of the County Council were or ought to be adequately covered by the fact that the Tottenham Company had undertaken to do something by agreement with the County Council. If anything he was present as a petitioner against alterations, and he had no reason to intervene unless there was some cause for it.

Mr. H. ROYSTON ASKEW said that the Luton Company contended that the laying of the through main by the Tottenham Company should not do any of these three things—viz. (1) interfere with the safety of any of the Luton Company's mains, (2) interfere with the access to any of those mains, and (3) occupy a position in a road or along the side of a road which the Luton Company might reasonably expect to require in the future for the purpose of local gas supply. The interests of the Tottenham Company was merely to get a supply of gas through to another area, but the interests of the Luton Gas Company were very different inasmuch as it had to maintain a supply of gas for local needs, and he had not the slightest doubt that the engineers of the two companies would be able to agree, as was done in the great majority of these cases. The difficulty had arisen because the Bedfordshire County Council had raised some objection to what the Luton Gas Company proposed, and said it believed that this proposal involved a derogation of the rights which the County Council had under a protective clause agreed with the Tottenham Company. In his view the protective clause which the Luton Company had proposed did nothing of the kind and was not intended to do so. Dealing with the proposed clause, Mr. Askew said it had been agreed between the Tottenham Company and the County Council that the Company should be advised of any road alterations which would affect the Tottenham Company's mains, and the Luton Company asked that it should be notified by the Tottenham Company of any such alterations affecting the position of mains and that it should have the right to make reasonable requirements as to the altered position of any such mains. The proposed Luton clause also provided that any differences should be settled by arbitration. In the absence of any such rights on the part of the Luton Company, action might be taken under the agreed clause between the Bedfordshire County Council and the Tottenham Company which would have a disastrous effect from the point of view of the Luton Gas Company. It could not be suggested that the proper way of dealing with this situation in which three bodies with public responsibilities were concerned was to refuse to permit one of them to be heard either as to proposals as to what should be done or in any arbitration proceedings that might take place—arbitration being provided for in the clause agreed between the Tottenham Company and the County Council.

Mr. A. V. WINSER (Parliamentary Agent) said the County Council could not accept the position which would introduce a third party into any relations which might exist between them and the Tottenham Company, for it would mean involving the County Council in arbitration proceedings between the two companies and perhaps in two separate arbitrations—viz., between themselves and the Tottenham Company and between the Tottenham Company and the Luton Company, for the reason that the two companies might not agree after the County Council and the Tottenham Company had agreed. Moreover, the proposal that the officers of the Luton Gas Company should have some power of supervision would conflict with the rights of the County Council as to supervision of any works carried out by the Tottenham Company.

UNITED KINGDOM GAS CORPORATION

LIMITED.

(Incorporated under the Companies Act, 1929.)

SHARE CAPITAL

Authorised:		Issued:
£1,000,000	in 1,000,000 4½ per cent. Cumulative Preference Shares of £1 each	£910,910
£1,000,000	in 1,000,000 Preferred Ordinary Shares of £1 each (entitled to a fixed non-cumulative dividend at the rate of 4½ per cent. per annum)	£160,910
£1,000,000	in 1,000,000 Ordinary Shares of £1 each	£750,000
£3,000,000		£1,821,820

DEBENTURE STOCK

Authorised:		Issued:
£400,000	3½ per cent. Debenture Stock	£400,000

Directors:

RICHARD BRUCE HAMILTON OTTLEY, 48, Seymour Street, London, W.1. (Director of Erlangers Limited.) *Chairman.*

COLONEL WILLIAM MONCRIEFF CARR, O.B.E., T.D., M.Inst.Gas E., Stretford, Nr. Manchester, Lancs. (Consultant Gas Engineer.)

ANGUS VALDEMAR HAMBRO, J.P., Merly House, Wimborne, Dorset.

HENRY FRANK HARDING JONES, The North House, Clareville Grove, London, S.W.7. (Director of Wandsworth and District Gas Company.)

MICHAEL HUBERT TETLEY, M.I.Mech.E., The Priory, Stevenage, Herts. (Director of Imperial Continental Gas Association.)

JOHN MICHAEL WHITTINGTON, The Flint House, Goring Heath, Oxon. (Director of South Western Gas & Water Corporation, Limited.)

The Subscription List was closed on Tuesday, 26th November, 1935, for the

ISSUE OF

600,000 4½ per cent. Cumulative Preference Shares of £1 each at 21s. per Share, and 250,000 Ordinary Shares of £1 each at 22s. per Share.

The Corporation was incorporated on the 25th January, 1935, for the purposes specified in its Memorandum of Association and in particular for the acquisition of shares, securities and interests in gas, electricity and water companies and undertakings, and for their management and development in the United Kingdom.

Its policy is to acquire control of such undertakings with a view to establishing co-ordination and co-operation in technical and commercial administration. In pursuance of this policy a controlling interest has already been acquired in: Ormskirk District Gas Co., Prescot & District Gas Co., Runcorn Gas Co., Frodsham Gas & Water Co.; Scarborough Gas Co., Bridlington Gas Co., Ackworth, Featherstone, Purston & Sharlston Gas Co., Drighlington & Gildersome Gas Light Co.; Aylesbury Gas Co., Woburn Gas Light Co., Ltd., and Rhymney and Aber Gas Co.

The Corporation holds over 99 per cent. of the Ordinary Share Capital in its associated Company the Caledonian Gas Corporation, Ltd. This Corporation has been formed to carry out similar objects in Scotland, and has acquired (*inter alia*) majority holdings in thirteen Scottish Gas undertakings.

The net Assets of the Corporation including the proceeds of the present issue amount to £2,224,580 of which, after making provision for the repayment of Bank Loans and all other liabilities, there is a surplus of £718,950 available for investment in accordance with the objects of the Corporation.

The net annual revenue of the Corporation, before charging Income Tax, based on the rates of dividend and interest paid in respect of the last financial year on the investments already owned by the Corporation and an estimated dividend on the Corporation's holding in the Caledonian Gas Corporation, Ltd., and including an estimate of the income from subsidiary companies for technical supervision, etc., together with estimated revenue from the investment of the above-mentioned surplus and deducting estimated costs of administration, including directors' fees and interest on Debenture Stock outstanding, amounts to £90,000. A full year's dividend on 910,910 4½ per cent. Cumulative Preference Shares requires £40,991 and on this basis is covered more than twice.

After providing for this Dividend and the full year's Dividend on 160,910 4½ per cent. Preferred Ordinary Shares there would remain the sum of £41,768 available for reserves and dividend on the Ordinary Shares, corresponding to 5·56 per cent.

Gas Markets and Manufactures

Stock Market Report

(For Stock and Share List, see later page)

After the elation brought about by the result of the General Election the inevitable reaction set in last week, and this, coupled with the apprehension over the franc, led to a falling off in the volume of business in most sections with some marking down of values. The general tone, however, was firm, and inquiries towards the close indicated a larger turnover for the current week. It is satisfactory to note that the Sunderland 3% then at 99½ was an instantaneous success. This week Brighton is offering £500,000 at a similar rate of interest, the price of the issue in this case being 101.

On the whole the Gas Market was not adversely affected by the general position, and where comparable the prices of recorded transactions were in most cases fractionally higher than those of the previous week. There were a few rises in price, and among these Newcastle units, which were in demand on the local Exchange, advanced 7½d. to 26s., and the Company's debenture stocks also hardened. North Middlesex registered a gain of 3 to 170. The only set-back of note was a drop of 11½ points in Imperial Continental stock to 185, while on the home Exchange Bristol ordinary fell 2 to 119.

Particulars will be found elsewhere in this issue of a sale by tender by the Alliance and Dublin Consumers' Gas Company of such an amount of ordinary stock as will with premiums realize the sum of £300,000. At the current middle market price on the London Stock Exchange—viz., £135%—the yield works out at £5 3s. 8d.%, though the last recorded transaction on this Exchange, which took place last month, was at 138½. During the past thirteen years the Company's business has been rapidly expanding which is evidenced by the fact that during this period the annual sales of gas have nearly doubled, while for the past eight years a dividend of not less than 7% has been paid on the ordinary stock, and a distribution at this rate was also made for the half-year to June last. The Company has not raised additional capital for twenty-five years, though during this time the capital account has been overspent by £290,619. The proceeds of the current issue are required to liquidate this amount and leave a balance to meet further commitments necessitated by the growth of the Company's business.

Current Sales of Gas Products

The London Market for Tar Products.

Nov. 25.

The prices of tar products are steady at about the following figures:

Business in pitch is reported to have been done at 40s. per ton f.o.b.

Creosote is steady at 5¾d. per gallon.

Refined tar, 4d. per gallon in bulk at makers' works.

Pure toluole, 2s. 5d. to 2s. 6d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha about 1s. 6d.; and 90/160 pyridine, about 4s. 9d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Nov. 25.

The average prices of gas-works products during the week were: Gas-works tar, 21s. 6d. to 26s. 6d. Pitch—East Coast, 37s. 6d. to 40s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 37s. 6d. to 40s.* Toluole, naked, North,, 2s. to 2s. 2d. Coal-tar crude naphtha, in bulk, North, 7½d. to 7¾d. Solvent naphtha, naked, North, 1s. 5½d. to 1s. 6d. Heavy naphtha, North, 11½d. to 1s. Creosote, *ex* works, in bulk, North, liquid and salty, 4⅞d. to 5d.; low gravity, 4⅜d. to 4⅞d.; Scotland, 4¾d. to 4⅞d. Heavy oils, in bulk, North, 4¾d. to 5d. Carbolic acid, 60's, 2s. 1d. to 2s. 2d. Naphthalene, £13 to £15. Salts, 65s. to 70s. bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Nov.* 23.

Business is now restricted to a certain extent for want of supplies. Prices are therefore firming up.

Crude gas-works tar.—The actual value is 27s. to 29s. per ton *ex* works in bulk.

Pitch.—Supplies are not plentiful in this area and value of vertical grade is round 32s. 6d. to 35s. per ton f.o.b. Glasgow for export, and round 32s. 6d. per ton *ex* works in bulk for home trade.

Refined tar remains unchanged at 2½d. to 2¾d. per gallon, f.o.b. naked.

Creosote oil.—There is a steady demand for available supplies and prices are not lower than the following: B.E.S.A. Specification, 5½d. to 5⅝d. per gallon; low gravity, 5¼d. to 5½d. per gallon; and neutral oil, 5¼d. to 5½d. per gallon; all f.o.r. in bulk.

Cresylic acid.—Owing to the exceptional demand in recent weeks supplies are now well looked after and the following may be taken as average prices: Pale, 97/99%, 1s. 4d. to 1s. 4½d. per gallon; dark, 97/99%, 1s. 2d. to 1s. 2½d. per gallon; and pale, 99/100%, 1s. 4d. to 1s. 5d. per gallon; all *ex* works naked.

Crude naphtha.—Production is small and value is steady at 5d. to 5½d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 4d. to 1s. 4½d. per gallon, and 90/190 heavy naphtha is 11½d. to 1s. per gallon.

Motor benzole commands 1s. 3½d. to 1s. 4d. per gallon in bulk at makers' works, with supplies scarce.

Pyridines.—90/160 grade is 5s. 6d. to 6s. per gallon, and 90/140 grade is 6s. to 6s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole . . .	0 9½	to	0 10	per gallon at works
Motor ,, . . .	1 3	,,	1 3½	,, ,, ,,
90% ,, . . .	1 4	,,	1 4½	,, ,, ,,
Pure ,, . . .	1 7½	,,	1 8	,, ,, ,,

Contracts Advertised To-Day

Coal.

Stellite, Ltd. [p. 656.]

Gasholder Repairs.

Neath Gas Department. [p. 656.]

Retorts.

Newcastle-under-Lyme Gas Department. [p. 656.]

Trade Notes

"Lead Wool" for Pipe Joints.

A copy of their revised booklet on pipe jointing, together with a separate useful chart giving details of cast-iron pipes and quantities of jointing materials with draft specification clauses, have been kindly sent us by the Lead Wool Company, Ltd., Snodland, Kent. These publications will no doubt be of interest to many of our readers and the Company inform us that they will be pleased to send copies on application.

Stanton Concrete Products.

From the Stanton Ironworks Company, Ltd., near Nottingham, we have received a copy of their latest list dealing with the firm's concrete products. Stanton concrete pipes, which are, of course, manufactured by the centrifugal process, are made in lengths ranging from 3 ft. to 8 ft. and with internal diameters of from 4 in. to 72 in. Full specifications, together with illustrations, are given of the various pipes in this list, while sections are also devoted to joints, specials, fence and gate posts, and concrete lamp standards.

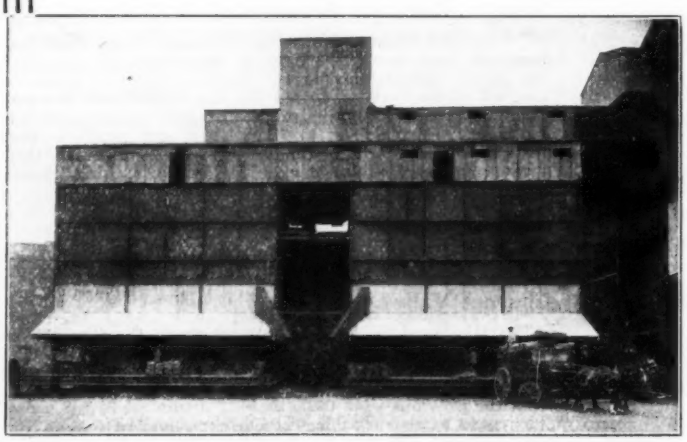
Gas Undertakings' Results

Churnet Valley.

The Directors' report on the working of the Churnet Valley Gas Company, Ltd., and statement of accounts for the year ended Sept. 30, 1935, show that the revenue account profit is £1,221. To this has to be added the unappropriated balance from the previous year £727, making a total of £1,948. Against this has to be charged debenture interest for the year, £276, and bank interest £72, making together £348, and leaving for disposal £1,600. The Directors recommend this sum shall be applied in the following manner—viz., by paying a dividend for the year ended Sept. 30, 1935, at the rate of 2½% per annum (less tax) £388, and by carrying forward to the current year the balance of £1,213. To meet the growing demand for a supply of gas in the Kingsley Holt district, a new length of 6-in. main of about 1,000 yards is being installed, and the result of this extension should be shown by increased receipts in the future.

Modern methods to meet modern demands . . .

The top picture shows the Glover-West vertical retort installations in service at the Buenos Aires Works of the Primitiva Gas Company. The West coke grading, storage and bagging units which operate in conjunction with them are shown in the photograph below.



THE **WEST** SYSTEMS for Gas & Coke Production and Related Processes

CLOVER-WEST VERTICAL RETORTS

•

WESTVERTICAL CARBONIZING CHAMBERS

•

WEST HANDLING PLANT FOR COAL AND COKE TREATMENT & PREPARATION

•

A MEMBER COMPANY OF

THE SOCIETY OF BRITISH GAS INDUSTRIES · 1905 ·

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: Albion Ironworks, Miles Platting. LONDON: Regent House, Kingsway, W.C.2

After December 1st, 1935, our address in London will be COLUMBIA HOUSE, ALDWYCH, W.C. 2

STOCK AND SHARE LIST

Official Quotations on the London and Provincial Stock Exchanges

Issue. £	Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Nov. 22.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Week.
1,551,868	Stk.	Sept. 9	7	7	Alliance & Dublin Ord. ...	130—140	...	...
374,000	,,	June 24	4	4	Do. 4 p.c. Deb. ...	97—102	...	...
557,655	,,	Aug. 12	7	7	Barnet Ord. 7 p.c.	165—170	...	...
300,000	1	Oct. 7	1/9⅓	1/4⅔	Bombay, Ltd.	1 5/16—1 7/16	...	26/6
178,480	Stk.	Aug. 12	9½	9½	Bournemouth sliding scale ...	222—232	...	...
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	168—173	...	171½—172½
489,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	147—152	...	150—152
50,000	,,	June 24	3	3	Do. 3 p.c. Deb. ...	83—88	...	...
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	105—110	...	...
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	123—128	...	126½—127½
357,900	,,	Aug. 12	7½	7½	Brighton, &c., 6 p.c. Con. ...	170—175	...	...
649,955	,,	,,	6⅔	6⅔	Do. 5 p.c. Con. ...	156—161	...	...
205,500	,,	,,	6	6	Do. 6 p.c. B. Pref.	142—147	...	...
1,487,500	,,	July 8	5	5	Bristol, 5 p.c. max.	118—120*a*	−2	...
120,420	,,	June 7	4	4	Do. 1st 4 p.c. Deb. ...	102—104*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	101—103*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	127—130*a*	...	...
855,000	,,	Sept. 23	8	7	British Ord.	152—157	...	153—155
100,000	,,	June 7	7	7	Do. 7 p.c. Pref.	155—160	...	157
350,000	,,	,,	5½	5½	Do. 5½ p.c. "B" Cum. Pref.	112—117	...	...
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	95—100	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	109—114	...	...
200,000	,,	,,	...	17/6⅔	Do. 3½ p.c. Red. Deb. ...	99—101	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	...
100,000	10	6 Nov.'33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	...
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb. ...	83—88	...	...
626,860	,,	July 22	6	6	Cardiff Con. Ord.	127—132	...	...
157,150	,,	Aug. 12	6½	5	Chester 5 p.c. Ord.	109—114*b*	...	...
98,936	1	Sept. 23	2/-	2/-	Colombo, Ltd., Ord.	1⅜—1¼	...	35/—35/3
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. ...	20/—22/	...	...
609,204	1	Oct. 7	-/11·48	-/11·48	Colonial Gas Assn. Ltd. Ord.	19/6—21/6	...	21/-
296,053	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	24/6—26/6	...	...
1,775,005	Stk	Aug. 12	6	5	Commercial Ord.	100—105	...	102—104
620,000	,,	June 7	3	3	Do. 3 p.c. Deb. ...	82—87	...	...
286,344	,,	Aug. 12	5	5	Do. 5 p.c. Deb. ...	121—126	...	125
807,560	,,	Aug. 12	7	7	Croydon sliding scale... ...	151—156	...	153½
569,590	,,	,,	5	5	Do. max. div.	113—118	...	116
620,385	,,	June 24	5	5	Do. 5 p.c. Deb.	123—128	...	126½
542,270	,,	Aug. 12	10	7	Derby Con.	175—185*c*	...	...
55,000	,,	June 24	4	4	Do. 4 p.c. Deb.	100—105*c*	...	...
239,000	,,	Aug. 12	5	5	East Hull Ord. 5 p.c.	109—112	...	...
181,625	,,	Aug. 12	6	6	East Surrey Ord 5 p.c. ...	129—134	...	...
175,609	,,	June 7	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
19,313,481	,,	Aug. 12	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	27/6—28 6*f*	...	28/—28/6
2,600,000	,,	,,	3⅓	3⅓	Do. 3½ p.c. max.	88—91	...	89—90
4,477 106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	105—108	...	106—107½
8,602,497	,,	June 7	3	3	Do. 3 p.c. Con. Deb. ...	88—91	+1	88—90⅔
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	116½—117
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	112—115	...	113½—114½
270,466	,,	Aug. 12	6	6	Harrogate New Cons. ...	132—137	...	...
140,000	1	Sept. 23	1/7½	1/7½	Hongkong & China, Ltd. ...	1¼—1½	...	...
213,200	Stk.	Aug. 12	6	6	Hornsey Con. 3½ p.c.... ...	130—135	...	...
5,600,000	,,	Nov. 4	14	8	Imperial Continental Cap. ...	180—190	−1½	181—196½
223,130	,,	July 22	3½	3½	Do. 3½ p.c. Red. Debs.	92—97	...	...
285,242	,,	Aug. 12	8½	8½	Lea Bridge 5 p.c. Ord. ...	175—180	...	175
2,167,410	,,	Aug. 12	6	6	Liverpool 5 p.c. Ord.... ...	133—135*b*	−1½	...
245,500	,,	June 7	5	5	Do. 5 p.c. Red. Pref. ...	105—110*b*	...	...
306,083	,,	July 8	4	4	Do. 4 p.c. Deb.	105—107*b*	...	...
165,736	,,	Aug. 26	10	8	Maidstone 5 p.c. Cap. ...	182—192	...	...
63,480	,,	June 24	3	3	Do. 3 p.c. Deb. ...	80—85	...	...
75,000	,,	May 27	†10	†10	Malta & Mediterranean ...	210—220	...	...
					Metropolitan (of Melbourne)			
392,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	98—103	...	...
231,978	Stk.	Aug. 12	5	5	M. S. Utility "C" Cons. ...	108—113	...	...
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	100—105	...	...
360,075	,,	June 24	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
148,955	,,	,,	5	†5	Do. 5 p.c. Deb. ...	120—125	...	...
125,000	—	July 1	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	97—100	...	...
675,000	,,	Nov. 18	†3	†3	Montevideo, Ltd.	48—53*	...	...
2,061,315	,,	Aug. 12	5⅔	5	Newcastle & Gateshead Con.	25/9—26/3*df*	+-/7½	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	107—108*d*	...	...
776,706	,,	June 7	3½	3½	Do. 3½ p.c. Deb. ...	100—102*d*	+1½	...
277,285	,,	Oct. 21	5	5	Do. 5 p.c. Deb. '43 ...	105—106*d*	+½	...
274,000	,,	Aug. 12	5	5	Newport (Mon.) 5 p.c. max....	113—118*a*	...	...
225,000	,,	Aug. 12	7½	7½	North Middlesex 6 p.c. Con.	165—175	+3	172½
396,160	,,	Aug. 12	5	5	Northampton 5 p.c. max. ...	105—110	...	...
300,000	,,	Nov. 4	†7	†9	Oriental, Ltd.	163—168*	...	166½—167
416,617	,,	June 7	8	8	Plym'th & Stonehouse 5 p.c.	162—167	...	...
504,416	,,	Aug 12	8½	8½	Portsm'th Con. Stk. 4 p.c. Std.	172—177	...	...
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	110—115	...	114½—115
114,000	,,	July 22	5	5	Preston 5 p.c. Pref.	106—111	...	...
321,961	1	Sept. 23	...	1/-	Severn Val. Gas Cor. Ld. Ord.	22/3—23/3	...	22/—23/-
319,510	1	,,	...	-/10⅝	,, ,, 4½ p.c. Cum. Pref.	21/9—22/9	...	...
1,736,968	Stk.	Aug. 26	6	6	Sheffield Cons.	140—142*e*	...	...
95,000	,,	June 24	4	4	Do. 4 p.c. Deb.	102—104*e*	...	...
133,201	,,	Aug. 12	5	8½	Shrewsbury 5 p.c. Ord. ...	135—140	...	140
90,000	10	May 27	‡3	‡3½	South African	3—4	...	...
1,061,779	1	Sept. 23	1/2⅜	1/2⅜	South East'n Gas Cn. Ld. Ord.	27/6—28/6	...	28/4½—28/6
845,016	1	,,	-/10⅛	-/10⅛	Do. 4½ p.c. Red. Cum. Pref.	22/3—23/3	...	...
450,000	Stk.	Aug. 12	4	4	Do. 4 p.c. Red. Deb. ...	100—103	...	...
6,709,895	,,	Aug. 12	6½	5	South Met. Ord.	134—137	−1	134—136½
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf. ...	147—152	...	...
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf. ...	105—109	...	107⅛
1,895,445	,,	June 24	3	3	Do. 3 p.c. Deb. ...	86—91	+1	89—90
1,000,000	,,	July 8	5	5	Do. 5 p.c. Red. Deb....	115—118	...	115½
209,820	,,	Aug. 12	8½	8½	South Shields Con.	171—173*d*	...	...
1,543,795	,,	Aug. 12	6	6	South Suburban Ord 5 p.c. ...	128—133	...	130—133
512,825	,,	,,	5	5	Do. 5 p.c. Pref. ...	118—123	...	120—122
500,000	,,	,,	4	4	Do. 4 p.c. Pref. ...	103—108	...	...
888,587	,,	June 7	5	5	Do. 5 p.c. Deb. ...	122—127	...	123½
250,000	,,	,,	4	4	Do. 4 p.c. Deb. ...	103—108	...	...
647,740	,,	Aug. 12	5	5	Southampt'n Ord. 5 p.c. max.	115—120	...	...
121,275	,,	June 7	4	4	Do. 4 p.c. Deb.	100—105	...	...
350,000	,,	Aug. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	112—117	...	...
200,000	,,	June 7	6½	6½	Do. 6½ p.c. Red. Deb. ...	98—103	...	...
94,000	,,	...	...	...	Do. 3½ p.c. Red. Deb. ...	97—102	...	...
1,076,490	,,	Aug. 12	6⅔	6⅔	Tottenham and District Ord.	149—154	...	151½—152
409,835	,,	,,	5⅓	5⅓	Do. 5½ p.c. Pref. ...	130—135	...	...
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	...	...
334,615	,,	June 7	4	4	Do. 4 p.c. Deb. ...	101—106	...	...
369,774	,,	Aug. 12	7	7	Uxbridge, &c., 5 p.c.	151—156	...	...
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	...	...
1,340,521	,,	Aug. 12	7	7	Wandsworth Consolidated ...	157—162	...	160½—162
1,371 373	,,	,,	5	5	Do. 5 p.c. Pref. *g* ...	118—123	...	...
1,317,964	,,	June 7	5	5	Do. 5 p.c. Deb. ...	123—128	...	...
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	104—109	...	...
158,400	,,	Aug. 12	6*g*	5	Winchester W.& G. 5 p.c. Con.	114—119	...	...

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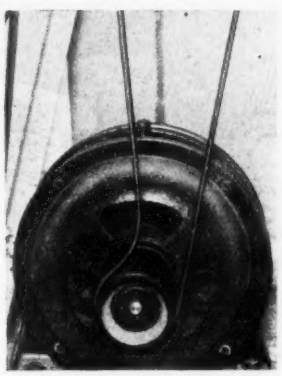

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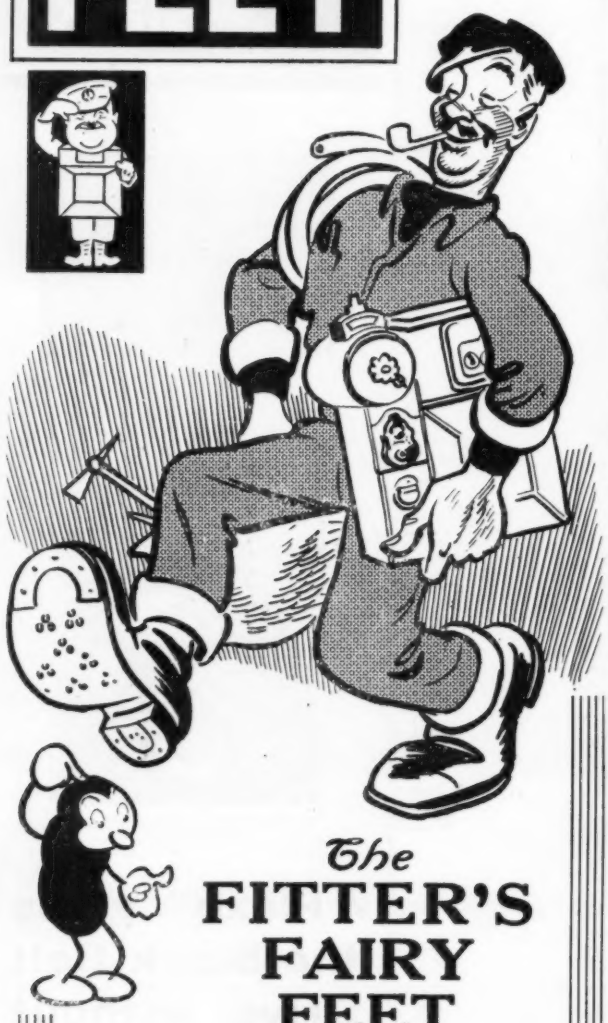

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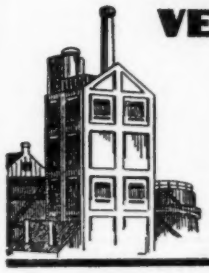

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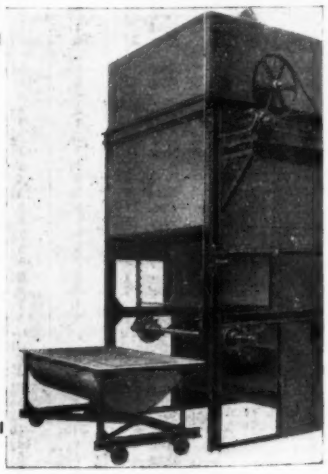

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